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ROCK PRODUCTS

NOVEMBER 1944

CEMENT · SAND AND GRAVEL · CRUSHED STONE · SLAG · LIME · GYPSUM
READY-MIXED CONCRETE · CONCRETE PRODUCTS · INDUSTRIAL MINERALS

• Mining of vitally-needed industrial sands at Ottawa Silica Co., Ottawa, Ill., is keyed to the enormous requirements of war industries.

NOV 28 1944

STEPPED-UP PRODUCTION AT LOWER OPERATING COSTS

Open view of the Williams "Slugger" Crusher showing heavy duty hammers, liners and discs.

the WILLIAMS "SLUGGER"

CRUSHES "ONE-MAN" SIZE STONE TO 1¼", ¾" OR AGSTONE IN

ONE OPERATION

Design Features Include: Discs arranged so hammers can be set out as they wear on end; manganese steel breaker plates adjustable toward the hammers; front end is steel casting, 3½ times stronger than cast iron; 1" thick manganese steel side cover liners.

CRUSHES AND PULVERIZES IN ONE OPERATION

The Williams "Slugger" Crusher and Pulverizer now makes it possible to crush large pieces of stone weighing from 75 to 100 pounds to 1¼", ¾" or agricultural limestone in one operation. Sledging is eliminated. The unnecessary expense of a primary crusher is eliminated and the costly need for recrushing "overs" is eliminated. With seven sizes to choose from—all sturdily built for long lasting wear—every producer, whether large or small, can profitably install a Williams.

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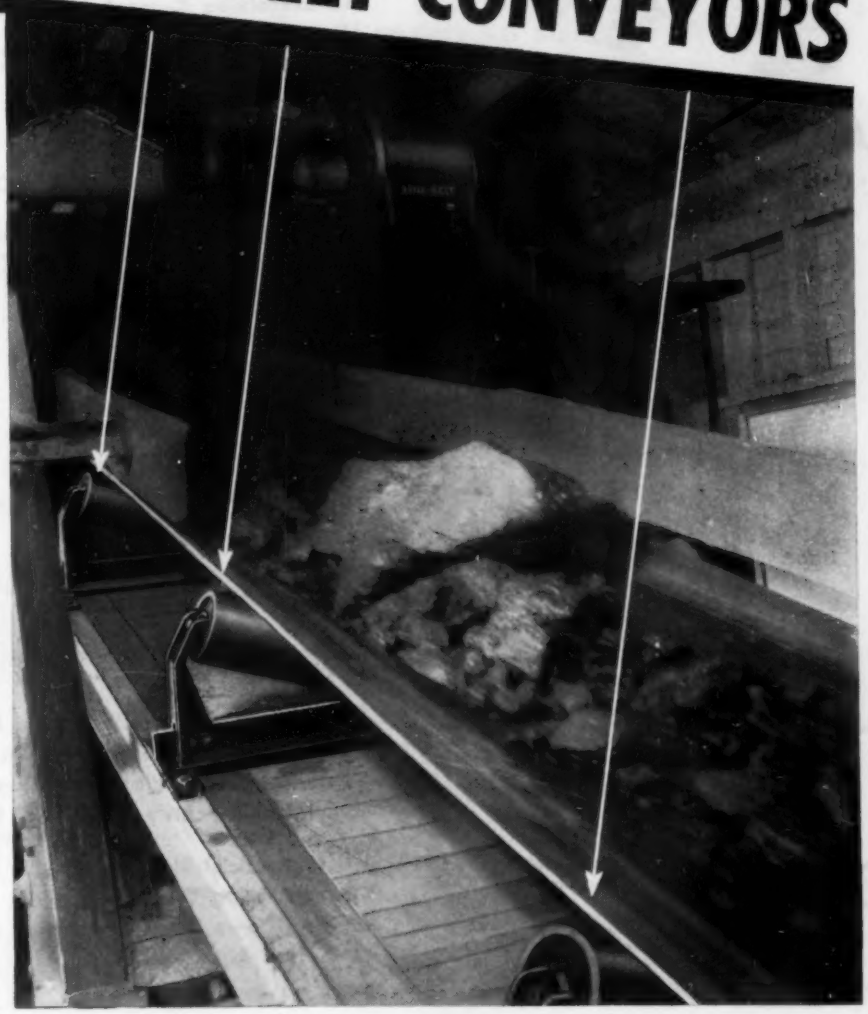
YOU can be assured of maximum belt life, minimum power and maintenance cost, and dependable trouble-free service with Link-Belt Anti-Friction Belt Conveyor Idlers and other equipment.

Link-Belt engineers pioneered in the development of anti-friction belt conveyor idlers and have consistently improved the original, fundamental design—the grease seal, bearing adjustment, shaft mounting and the supporting stands and brackets. All with the result that today's Link-Belt designs offer the very best in belt conveyor equipment to keep production "On the Move" for Victory.



36" wide belt conveyor equipped with Link-Belt type "70" troughing idlers and type "71" return idlers, handling mine run ore from mine ore bin to vibrating grizzly and picking belt at the rate of 100 T.P.H. Conveyor is operated by a Link-Belt Motorized Speed Reducer and Silverlink Roller Chain Drive.

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Saves accidents — can't be put on wrong; doesn't weaken rope; greater holding power.

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"Fist-Grip". Fewer Safety Clips hold rope straight in smooth, vise-like grip, with no protruding threads to get battered in use. Clips and rope can always be used on the next job.

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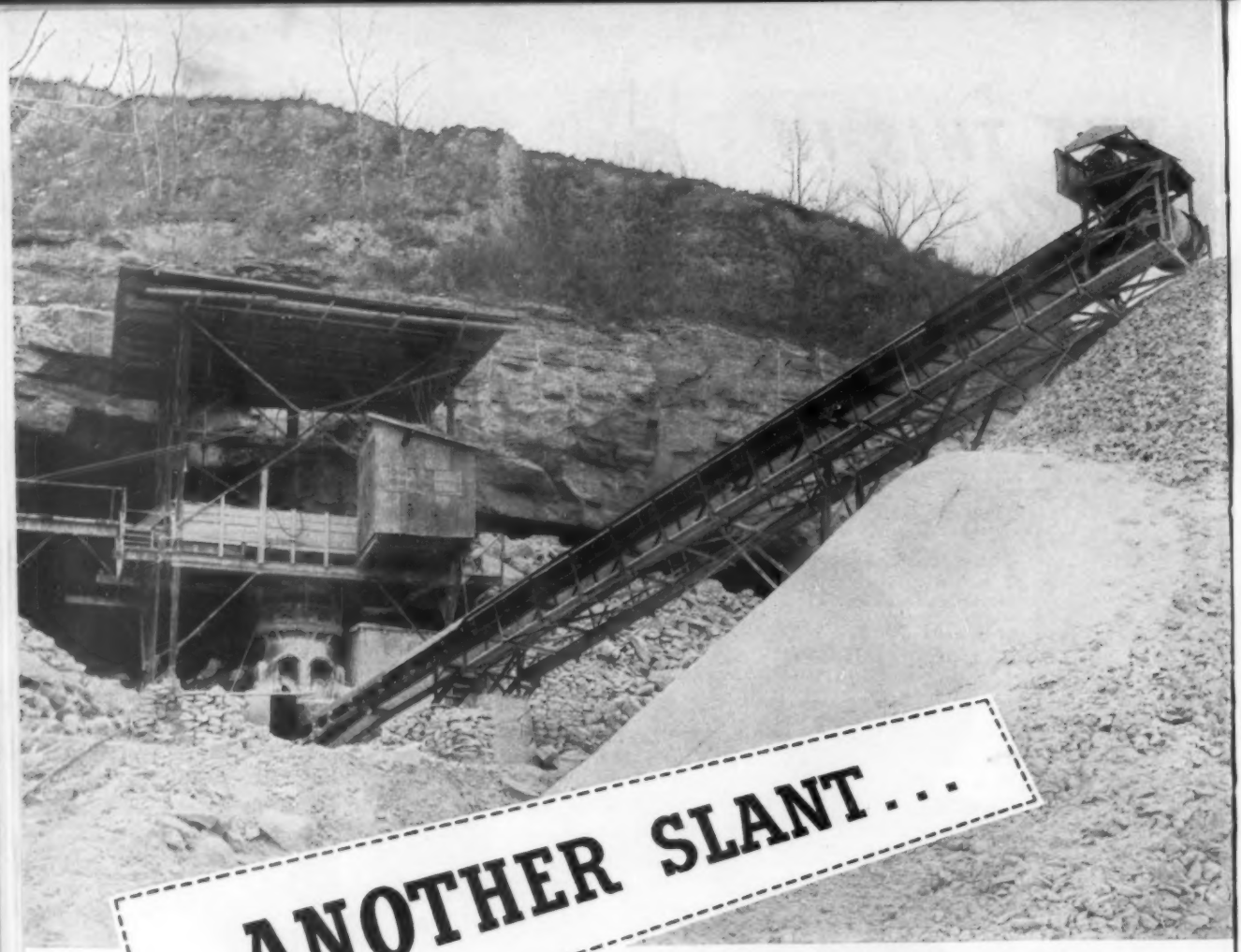

ANOTHER SLANT . . .

The above belt conveyor is one of several Stephens-Adamson conveyors in operation at a mid-west stone quarry. The conveyor shown, piles crushed stone on a 1250 ton capacity stockpile which can be completely reclaimed by other S-A feeders and conveyors not shown.

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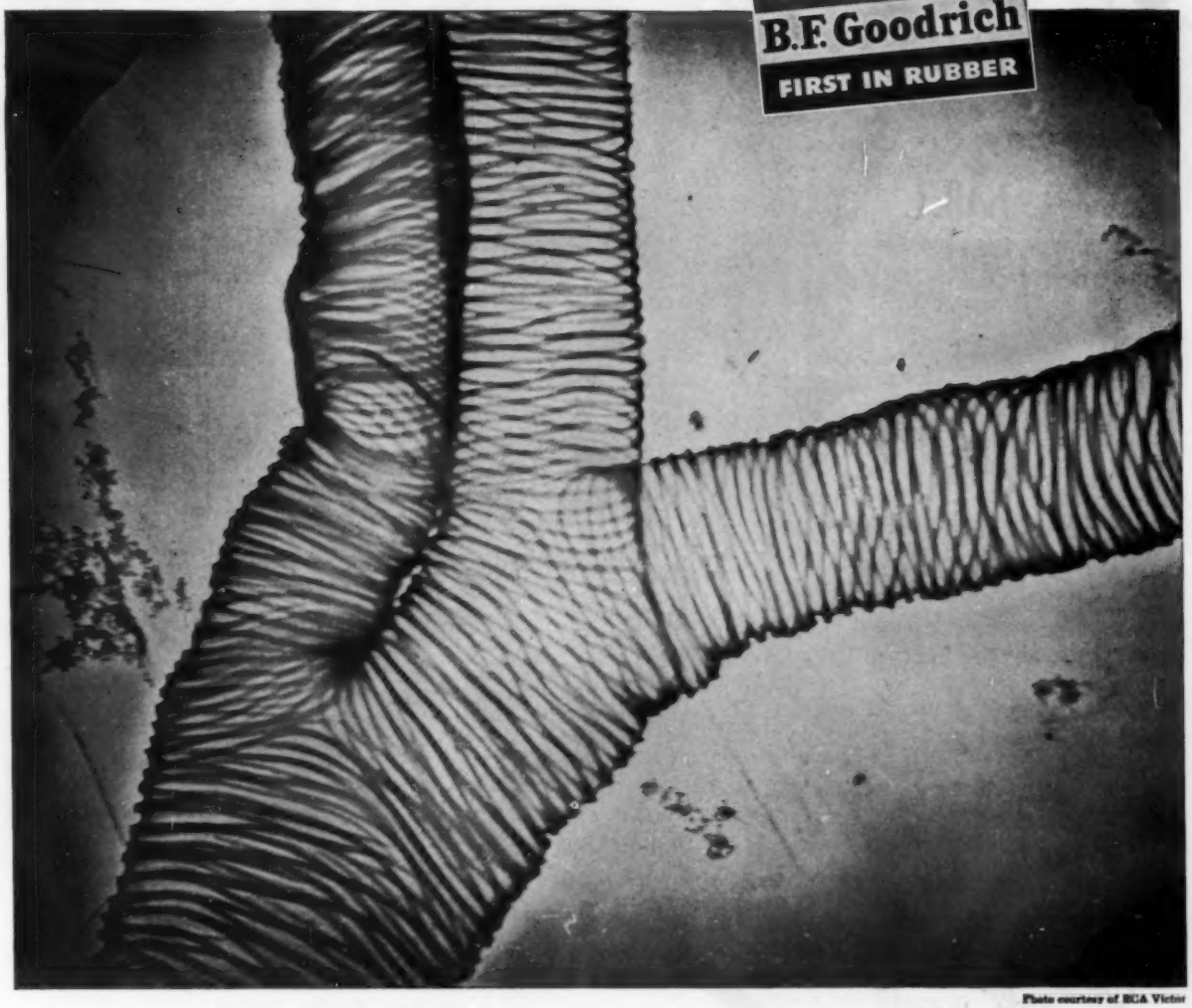

Photo courtesy of RCA Victor

Mosquito's windpipe

A typical example of B. F. Goodrich development in rubber

THAT picture was made possible by an electron microscope that can make ordinarily invisible objects look as much as *200,000 times their real size.* But more important than a picture of a mosquito's windpipe is the fact that scientists recently had their first look at a flu germ, thanks to this far-reaching scientific development. Almost daily, it brings to light new discoveries of great importance in the fields of medicine, industry and agriculture. But for months, the success of the electron miscroscope was threatened by the failure of a little sealing ring.

Because it operates by means of a vacuum, an absolutely air tight seal was needed for all the openings. Rubber was tried but couldn't stand the constant pressure or the oil that reached it from the vacuum pump. Leaks developed quickly. And sulphur in the rubber occasionally got into the instrument, upsetting its delicate workings. Results were always uncertain.

For two years scientists searched for a material that would meet the microscope's requirements. After many failures they learned of the oil-resisting B. F. Goodrich synthetic rubber used for bullet-sealing gasoline tanks, high-pressure hydraulic seals, and many other purposes. B. F. Goodrich developed a new compound of this material, containing no sulphur, that could stand the high pressures without weakening. Gaskets of this material were made and tested. They provided a perfect seal — and the microscope *stayed* sealed. No leaks, no breakdown. Today, these gaskets are standard equipment on production models of the instrument that gives promise of scientific advancement undreamed of a few short years ago. *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

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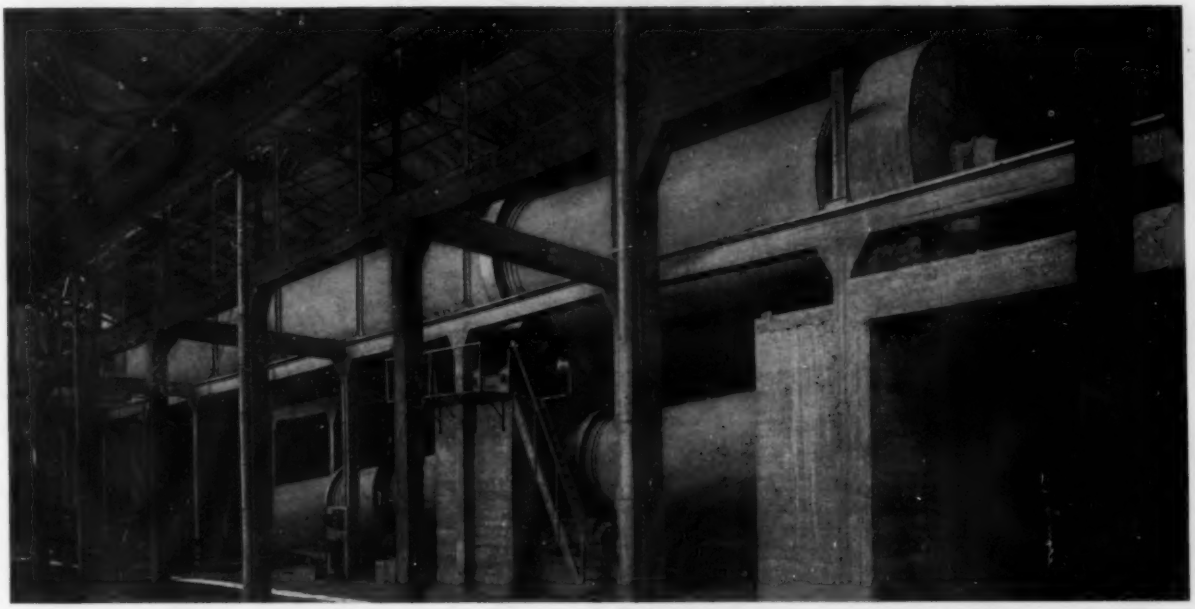

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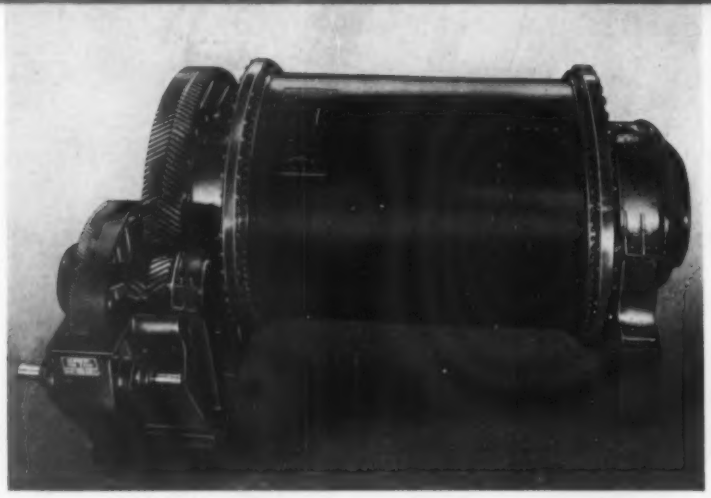

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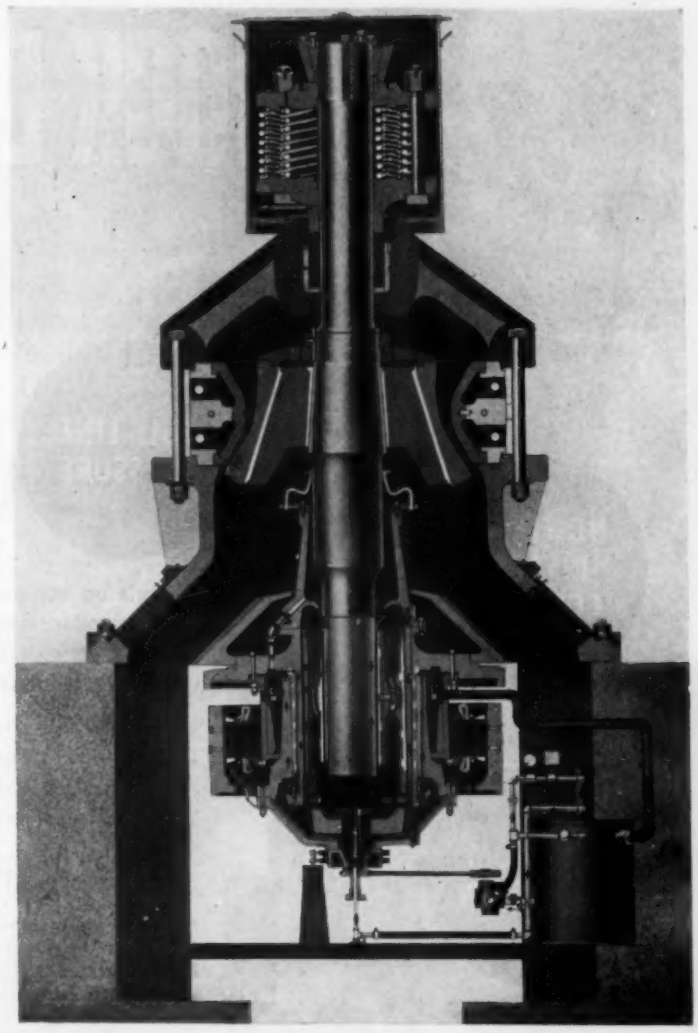

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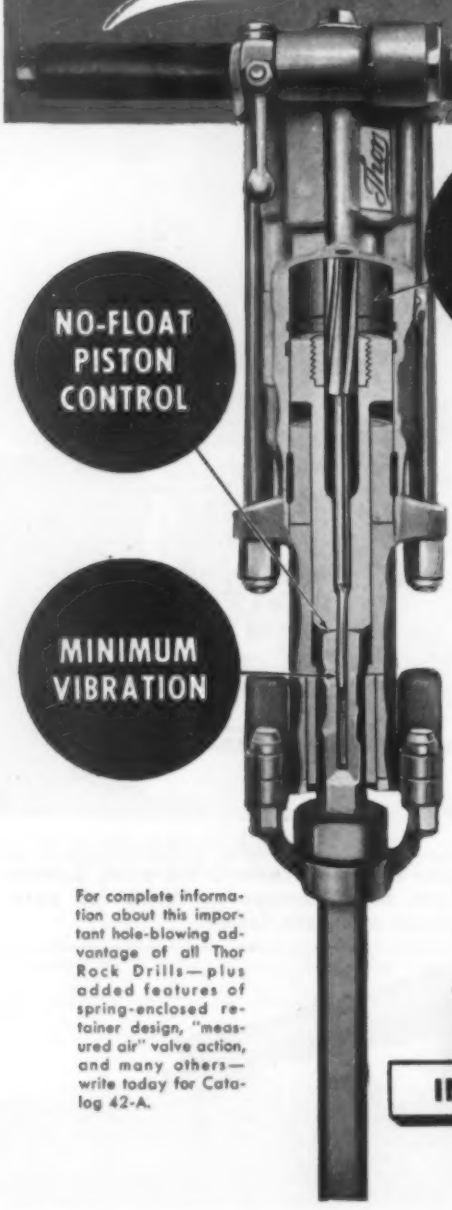

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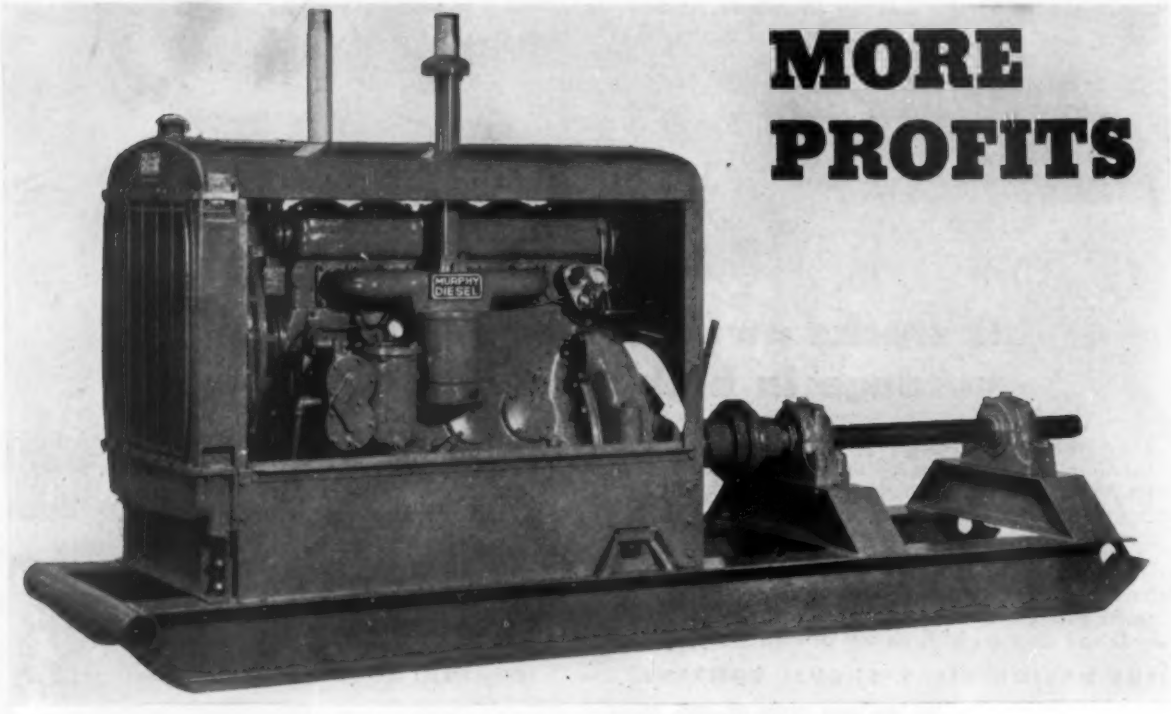

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APPLICATIONS	ROD NUMBERS Gas	Arc
Bowl mill liners	(1)	112, 101
Bucket heels and latches	(1)	112, 101
Bucket pins and links	1	112, 101
Bucket teeth and lips	(1)	112, 101
Bull heads	(1)	112
Clam shell bucket parts	(1)	112, 101
Clinker spreader bars	(1)	112
Coal crusher plates	(1)	112, 101
Concrete mixer blades and plates	(1)	112, 101
Conveyor bucket dumping dogs	(1)	112, 101
Conveyor bucket edges	(1)	112, 101
Conveyor bucket shoes	(1)	112, 101
Conveyor pipe bends	(1)	112, 101
Crusher rolls, hot clinker		112, 101
Crusher rolls, ore and limestone		112, 101
Die rings, Hercules Mill		112
Die rings, Raymond Mill		112
Dipper and dragline bucket parts	(1)	112, 101
Discharge spouts, Hercules Mill	(1)	112
Disintegrator bars	(1)	112
Drag chain links	(1)	112, 101
Fan blades	(1)	112, 101
Feed chutes, tube mill	(1)	112, 101
Fuller-Kinyon pump journals boxes	(1)	112, 101

APPLICATIONS	ROD NUMBERS Gas	Arc
Fuller-Kinyon pump screw flights	1	112, 101
Gudgeons	(1)	112, 101
Hammers	(1)	112, 101
Jaw crusher plates	(1)	112, 101
Pins and lugs, hairpin gypsum mixer	(1)	112, 101
Plow points and skirts, coal pulverizer	(1)	112
Retainer rings, Hercules Mill	(1)	112
Rockwool shredder teeth	(1)	112, 101
Roll crusher shells	(1)	112, 101
Roll crusher teeth	(1)	112, 101
Sand washer screw flights	(1)	112, 101
Saw teeth, gypsum mixer	(1)	112, 101
Screw conveyor flights	(1)	112, 101
Segment plates, tube mill	(1)	112, 101
Shovel teeth and lips	(1)	112, 101
Slag bucket teeth, cold slag	(1)	112
Slag bucket teeth, hot slag	(10, 1)	110, 112
Swing rolls, Bradley and Raymond Mills		112
Tamper feet and legs, cement block machine	(1)	112, 101
Trowels for shaping concrete pipes	(1, 4)	112, 101, 104

(.) Parentheses in the "GAS" column indicate applications where gas welding may be used, but arc welding is recommended.

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for 20-Ton Locomotive Illustrated Above

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Maximum Safe Speed, M.P.H.	20.0

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One Westinghouse Single-Station E.M. Control

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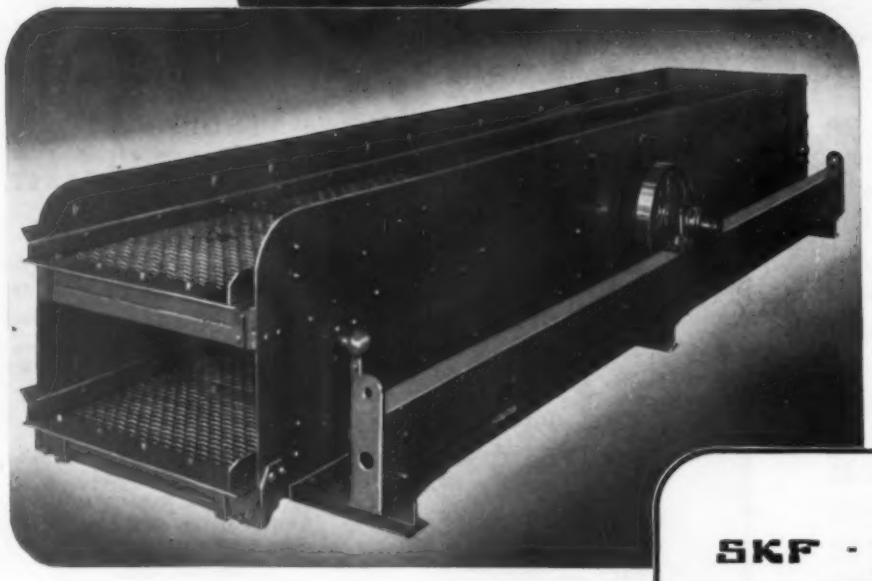

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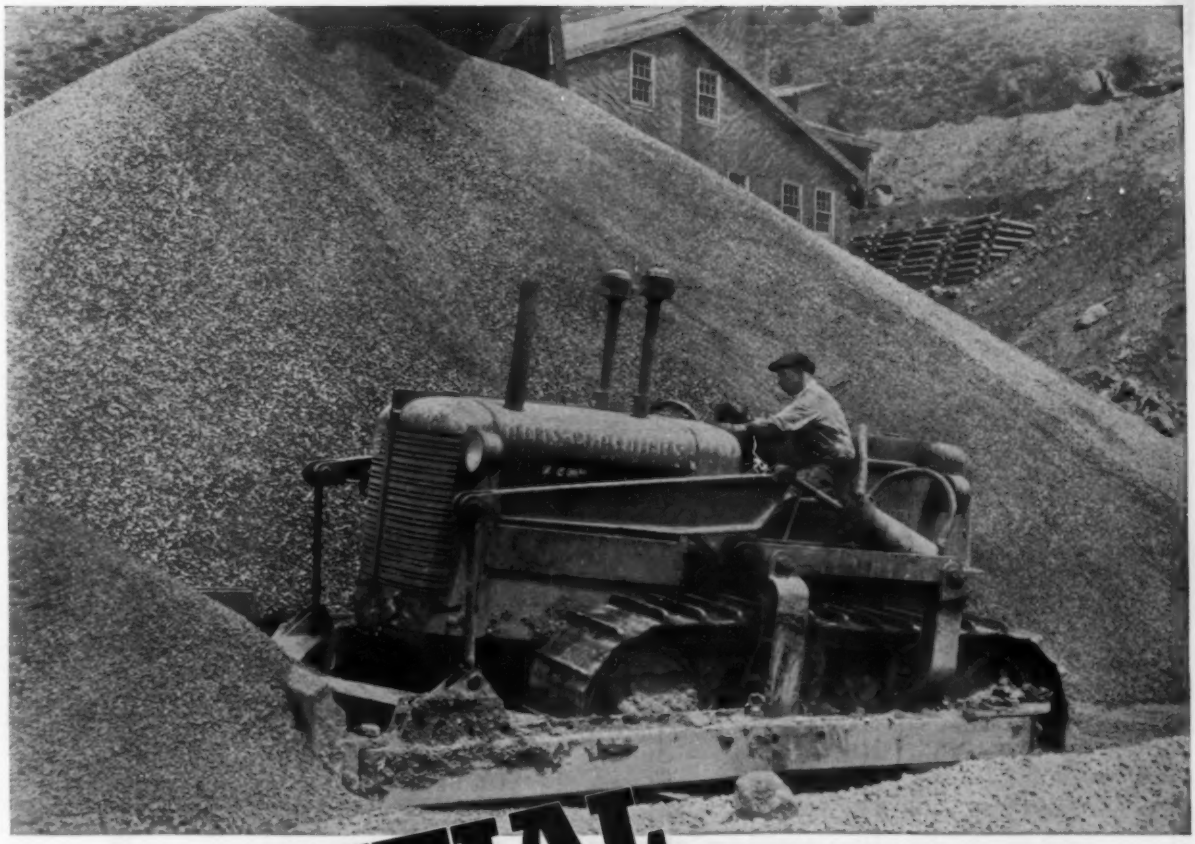

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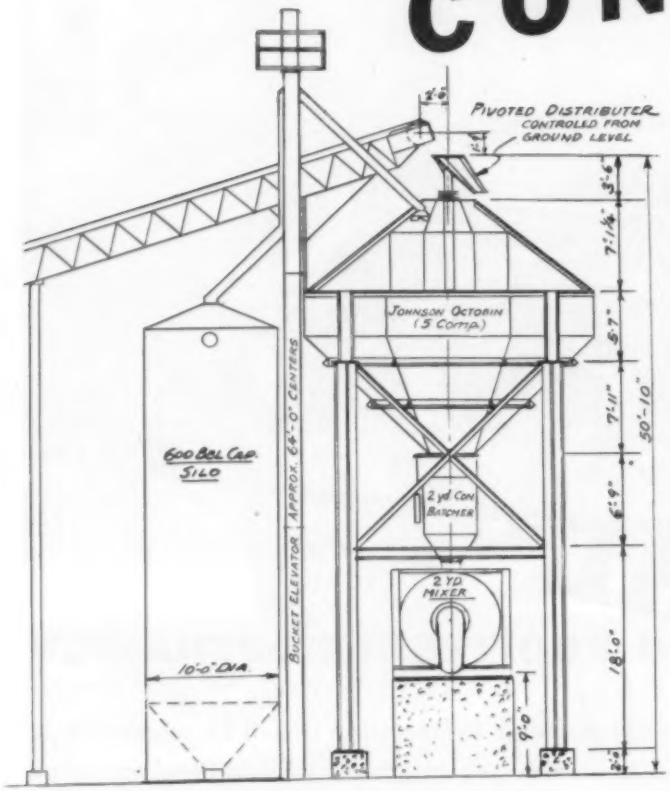

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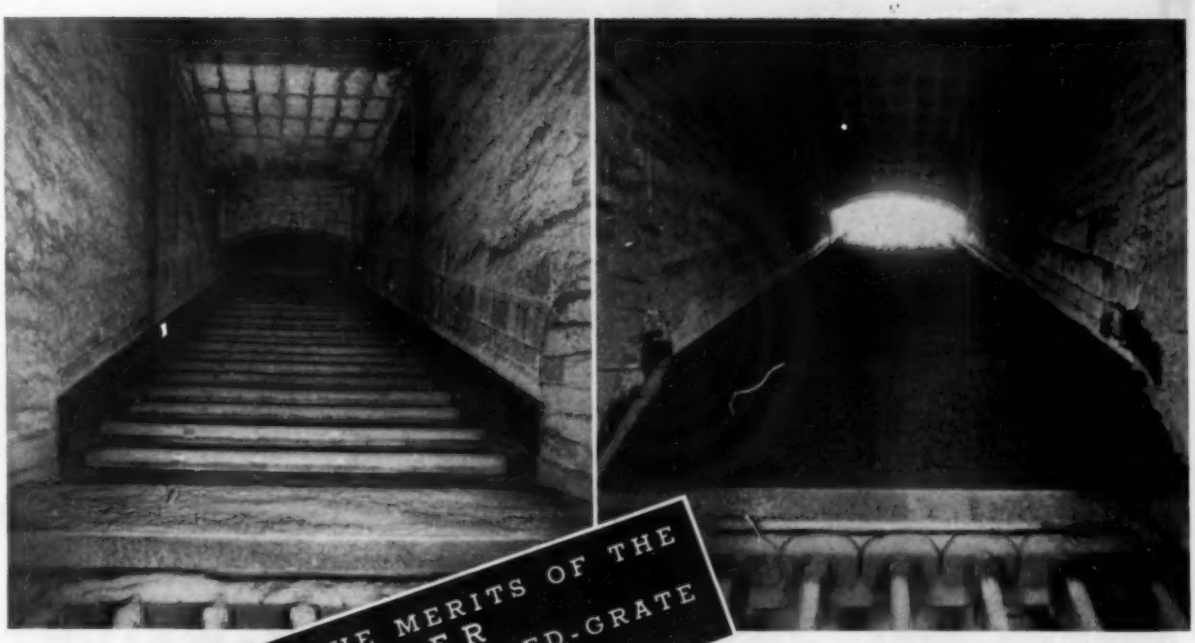

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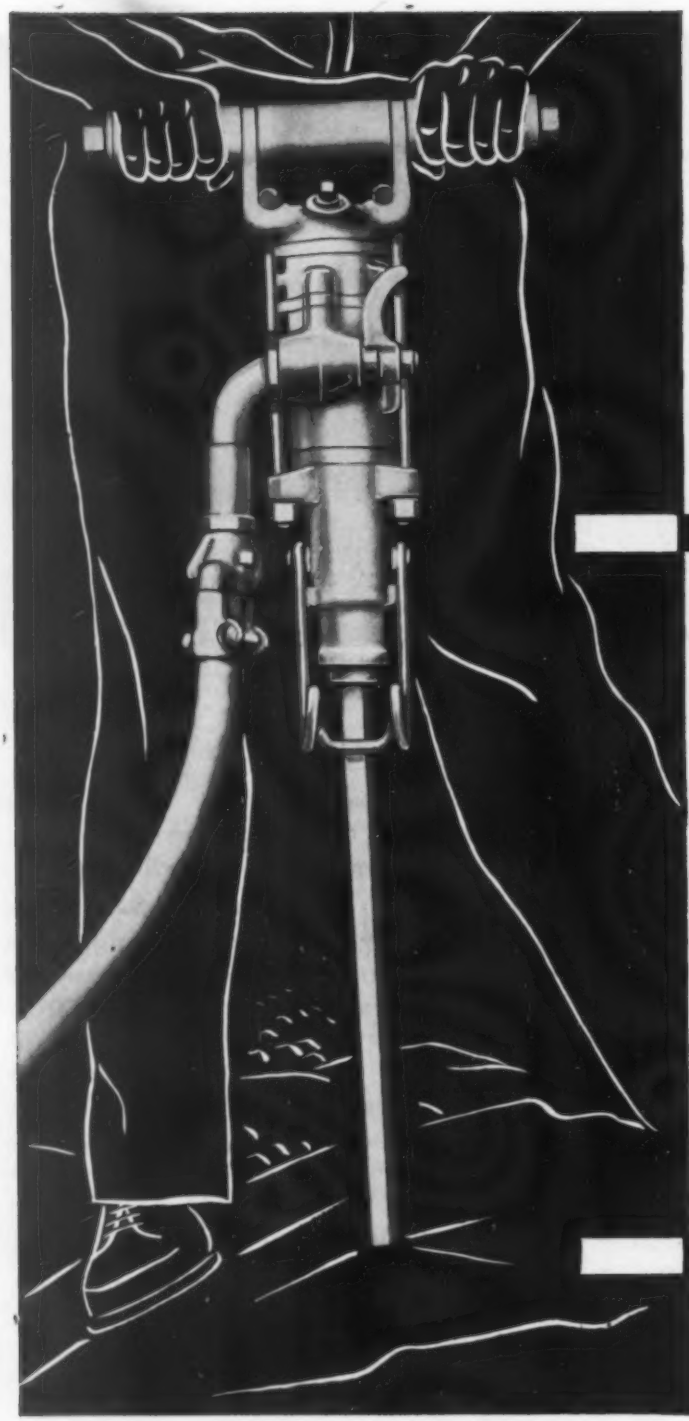

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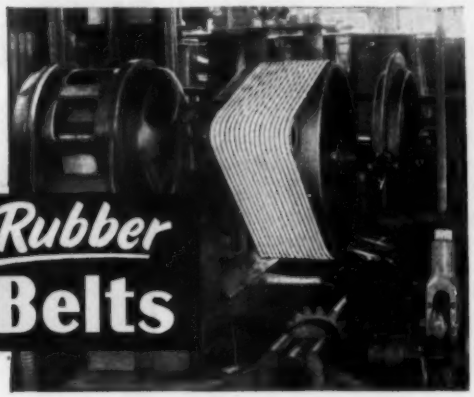

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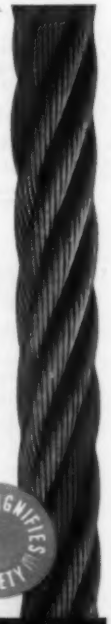

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PRODUCTION COSTS UNDER EXAMINATION

MANY THEORIES are being advanced by economists in groping for the key to post-war prosperity and full employment. There seems to be some agreement that there must be an expanding rate of consumption with a raised standard of living. The supposition is that high wage levels are the means for raising and maintaining purchasing power so that workers will be able to buy the products of mass production. Industry must be given every incentive to expand, in the minds of these authorities.

If living costs will continue high or trend higher, wages will have to be maintained above prewar levels but, whatever the level of costs, it must not be forgotten that industry must have and will be entitled to fair earnings.

Organizations such as the Brookings Institution predict that the basic wage and salary rates in an average early post-war year will be approximately at 1943 levels and that there will be a return to the 40-hour work week. No appreciable change is anticipated in general price levels. This would mean that labor will continue to be a higher than normal portion of the total cost of any commodity. The solution, under a competitive system of doing business, would have to be in increased production per hour of plant operation, to reduce unit costs. Rising prices alone cannot be depended upon to offset higher costs of operation.

The war has focused the attention of the rock products industry, and all industry, on the labor costs that enter into production. We may anticipate more effective utilization of labor in the post-war years, not to reduce labor costs in total outlay but to minimize the cost of labor per unit of output.

Job Analyses

During this year, several producers of rock products, recognized for their keenness as skilled operators, have initiated studies in their plants, which are aimed at optimum utilization of labor and machinery. They recognize that inefficiency exists in their operations and believe that a scientific approach to production and its costs will lead to reduced post-war operating costs.

Specialists have been called in to make detailed analyses of all phases of production and to develop facts now unknown about plant operations, facts which are little understood and usually underestimated. Losses in production are unmeasurable, of course, unless the facts are known. Operational failures are to be sought out and corrected and each job is to be evaluated and a scale of wages set up that will enable the worker to profit proportionately to the effort he expends in increasing production. The worker stands to gain, since premium wages will be paid for performance on his assigned job over and above an established rational base.

This approach to operating efficiency, and premium wages paid for work well done, seems reasonable. It would combine the fundamentals of a wage incentive plan with knowledge of what should be done for each department to function at its maximum efficiency and the entire operation as a coordinated whole. The success of such a plan depends upon the technical ability and knowledge of those conducting the job analyses, whether outside specialists are engaged or producers attempt to analyze their own operations.

The most interesting thing about all this *to us* is that very real attempts are being made to get to the causes for high costs, that is, costs which are controllable. A cent or two saved in the cost of producing a ton of a low priced commodity like gravel or crushed stone is significant but we often have wondered if the dollars and cents value of a few precious minutes of production time lost during a day is fully appreciated. It may be that such loss in production hasn't been important but maybe it will be.

Controllable Costs

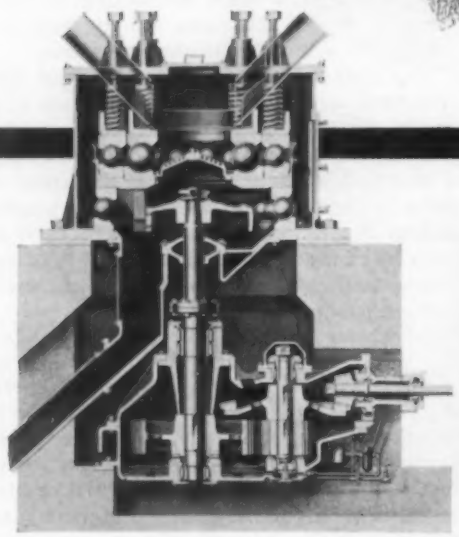
A typical example of interruption to operation that we have observed many times over is the lodging of oversized blocks of stone in a primary crusher. This is probably a too obvious example, but the production lost each day while rock is barred out or blasted loose would amount to thousands of tons a day for the industry. If the delay be only 15 minutes a day, and only *once* in a day, in a 200-ton per hour straight-flow plant employing 30 men, there is a loss of production of 50 tons. At an assumed average rate of 75c for labor, approximately $6.00 has been lost irretrievably.

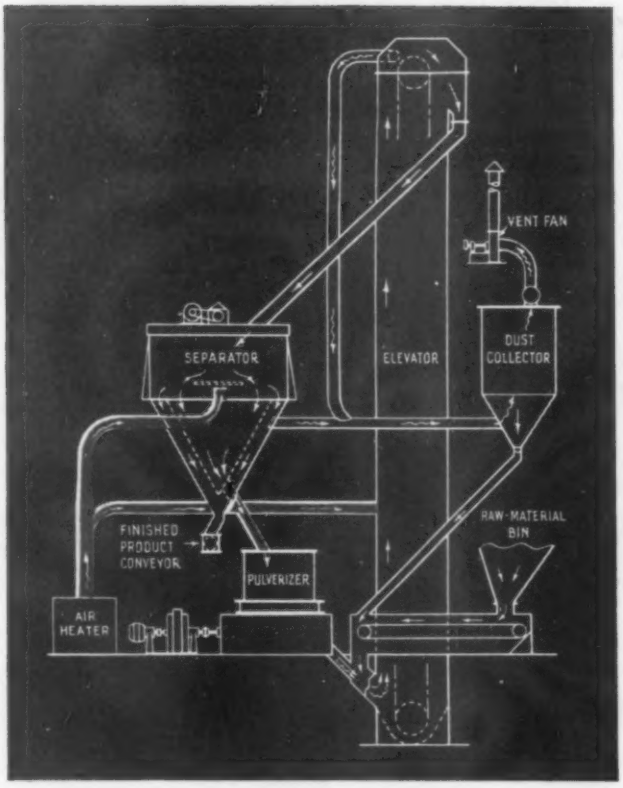
Experts tell us that an aggregates plant must be kept uniformly loaded to capacity for maximum efficiency, but just as often as not we see conveyor belts alternately loaded and running empty. We might go further and ask how much time is lost in unnecessary travel of a shovel boom in the repetitive loading of cars or trucks or how many gravel producers know how much, and the character of, fines they are losing in classifying sand. There may be profits in those fines.

Correction resolves itself into the correlation of shovel bucket sizes and blasting practices with the crusher opening measurements, the use of suitable feeders and other control devices, etc. The examples we mention are elementary, but we merely raise the point that it will pay to analyze such typical routine operations.

Bror Nordberg

DRYING AND GRINDING in ONE operation...with the B&W Closed-Circuit System





- Eliminates separate drying equipment
- Reduces cost of kiln feed
- Substantial circulating load assures a well-blended product

THE BALL-BEARING PRINCIPLE OF GRINDING MAKES THESE ADVANTAGES POSSIBLE

THE BABCOCK & WILCOX CO.

85 LIBERTY STREET, NEW YORK 6, N. Y.

C-58

★ ★ ★ Washington NEWS

W.P.B., through correspondence with V. P. Ahearn, executive secretary, National Ready Mixed Concrete Associations, has suggested that producers can save unnecessary transportation by installing sufficient bin capacity for cement to handle carload lots.

CARL F. CLAUSEN, chief, non-metallics section, building materials division, W.P.B., advised Secretary Ahearn that: "In the past year and half we have known of a number of companies who have installed bin equipment for bulk cement rather than handle sack cement. However, a large number of companies have not provided for and do not have adequate bin capacity to receive full capacity hopper bottom cars of bulk cement, nor do they seem to have provided for any reasonable surplus capacity to unload a full capacity car when such is received before all the cement can be removed from the bins."

Prices Pulverized Silica

O.P.A. by amendment 7 to MPR 327 has authorized increases in the price of ground flint, quartzite and shale according to formula, whereby the seller submits his new price to O.P.A. for approval, and it stands approved unless acted on within 15 days. If disapproved, the price submitted may be revised downward and the seller compelled to refund the difference within 15 days.

"When filing such a price with the Office of Price Administration, the seller shall set forth, in addition to the net price, his list price, and all discounts, allowances and differentials for all classes of buyers, a description and identification of the commodity, a statement of facts differentiating such commodity from the other commodities sold by the seller, a statement showing how the proposed price was determined, and a description of the use or users for which the commodity is to be produced.

"3. Section 1438.8 is amended to read as follows:

"(8) *Adjusting pricing.* It is permissible under this Regulation to provide in a contract that the price shall be adjustable to a price not higher than the maximum price in effect at the time of delivery."

Veterans' Home-Building

W.P.B. has made possible immediate priorities assistance to discharged veterans of the present war for building or remodeling their homes according to an announcement by the War Production Board and the National Housing Agency.

Under the new procedures, applications may be approved for the construction, alteration or betterment of houses to be owned and occupied by veterans who have received an honorable discharge from the Army, Navy, Marine Corps or Coast Guard since December 31, 1940, and who are unable to find other suitable living quarters.

Veterans seeking authorization to build or remodel homes under the new procedure should file their application on Form WPB-2896 with the nearest office of the Federal Housing Administration, a unit of the National Housing Agency. Approval of the application will authorize the veteran to extend a priority rating and use an allotment symbol for the purchase of his material and equipment in accordance with the War Housing Critical List and the War Housing Standards, officials said.

F.T.C. Hearing

FEDERAL TRADE COMMISSION is investigating the Florida Hard Rock Phosphate Export Association and Phosphate Export Association. A hearing in Washington began for members of the first named association on September 25 and for the latter on October 16. John W. Norwood was appointed examiner for the commission in each instance.

New Price Regulations for Agricultural Lime

UNDER DATE of October 7, the O.P.A. issued RMPR 386, which is a complete revision of the method of fixing maximum prices for agricultural liming materials, in substances as follows:

Article I—Scope and Miscellaneous Provisions of the Regulation

Section 1. Applicability—(a) In general. Except as provided in paragraph (b) of this section with reference to emergency sales to the United States and its agencies and paragraph (c) of this section with reference to export sales, this regulation shall apply to all sales of agricultural liming materials, whether sold for immediate or future delivery, within the District of Columbia and the 48 states of the United States.

(b) Emergency purchases. This regulation shall have no application to any purchases by the United States or any of its agencies under such circumstances of emergency as to make immediate delivery imperative and as to render it impossible to secure or unfair to require immediate delivery at the maximum price which would otherwise be applicable if such purchases and deliveries are made pursuant to the provisions of section 4.3 (f) of Revised Supplementary Regulation 1 to the General Maximum Price Regulation, as amended: **Provided, however,** That the Administrator may, by order, waive the reporting of any part of the information required by section 4.3 (f) in connection with a particular purchase or group of purchases upon determining that such information may not reasonably be required under all the circumstances, and he may, in lieu thereof, require the reporting of other information more suited to the circumstances.

Sec. 2. Sales at other than maximum prices—(a) Prohibition. Regardless of any contract or obligation, no person shall sell or deliver, and no person, in the course of trade or business, shall buy or receive agricultural liming material at a price above the maximum price established by this regulation for such sale, nor shall any person agree, solicit, offer or attempt to do any of the foregoing. This prohibition, however, is subject to the provision for adjustable pricing contained in paragraph (b) of this section, the exception for emergency purchases by the United States and its agencies contained in paragraph (b) of section 1 and the exception for export sales contained in paragraph (c) of section 1.

(b) Adjustable pricing. Any person may agree to sell at a price which can be increased up to the maximum price in effect at the time of delivery, but no person may unless authorized by the Office of Price Administration, deliver or agree to deliver at prices to be adjusted upward in accordance with action taken by the Office of Price Administration after delivery. Such authorization may be given when a request for a change in the applicable maximum price is pending, but only if the authorization is necessary to promote distribution or production and if it will not interfere with the purposes of the Emergency Price Control Act of 1942, as amended. The authorization may be given by the Administrator or any official of the Office of Price Administration having authority to act upon the pending request for a change in price or to give the authorization. The authorization will be given by order except that it may be given by letter or telegram when the contemplated revision will be the granting of an individual application for adjustment.

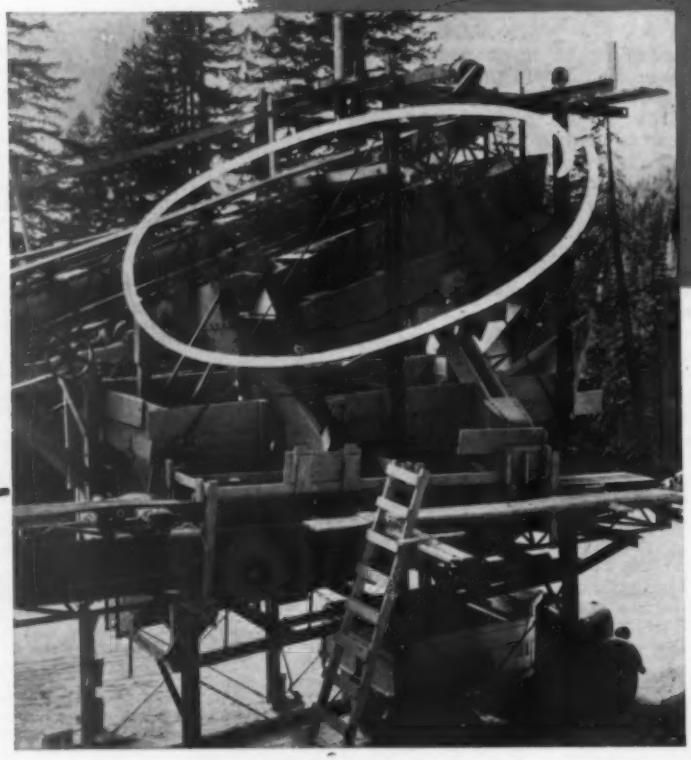
(c) Lower prices. Prices lower than the maximum prices established by this regulation may, of course, be charged or paid.

Sec. 3. Evasion. The price limitations set forth in this regulation shall not be evaded whether by direct or indirect methods, in connection with any offer, solicitation, agreement, sale, delivery, purchase, or receipt of or relating to agricultural liming materials, alone or in conjunction with any other commodity, or by way of commission, service, transportation, or other charge, or discount, premium, or other privilege, or by tying agreement or an agreement requiring the buyer to sell any commodity in return, or other trade understanding or by any other means.

Sec. 4. Transfers of business or stock in trade. If the business, assets or stock in trade of any business are sold or otherwise transferred after the effective date hereof, and the transferee carries on the business, the maximum prices of the transferee shall be the same as those to which his transferor would have been subject if no such transfer had taken

(Continued on page 102)

OUTSTANDING SCREENING PERFORMANCE UNDER *Every* IMAGINABLE CONDITION



The 4' x 12' Triple Deck Simplicity Gyrating Screen shown in this Temporary Plant handles 2000 tons per day of 18" and under rock. Another user reported an increase of 50% in plant capacity merely by replacing its screening unit with a Simplicity of the same size.

- For the Navy CB's
- Up in Canada and Alaska
- Down in Mexico
- In Foreign Lands
- And at Home in Hundreds of Plants

Simplicity

GYRATING SCREENS

In the far-away corners as well as the cross-roads of the World, Simplicity Gyrating Screens have been used and have given the same highly satisfactory results. Each report of new installations and uses confirms the testimony of long-time Simplicity users—that here is the screen that can be counted upon to give maximum tonnages of clean, accurately sized materials with low power requirements and a minimum of maintenance. Standard features include a counterbalanced eccentric shaft; rubber-mounted screen corners, screens in four-way tension over doubly crowned surface, dust sealed Alemite lubricated roller bearings; extra rugged construction; and rubber cushioned power. Write today for the complete facts.

Simplicity

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ENGINEERING COMPANY

DURAND, MICHIGAN

Annual Pay Guarantees

HOW MANY readers listened to the Town Hall radio program on Thursday night, October 12? Any employer of day labor would have found it interesting and instructive. That the issue of guaranteed annual incomes for hourly wage employes is a live one in our industries we know from discussions with company executives in these industries, some quite recent, some a number of years ago.

The growing strength and political influence of organized labor will probably bring the issue very much to the fore in the post-war period. Moreover, the unions are beginning to employ economic specialists who are quite competent to argue their case with the best talent on the management side of industry. Also, there are some on management's side who believe that a guaranteed annual wage is not only a good thing socially, but feasible.

The issue is specially alive right now because the C.I.O. Steel Workers' Union is pressing it before the powers-that-be in Washington. Harold J. Ruttenberg, research director of the union, spoke in favor of a guaranteed annual income in the steel industry on the Town Hall program. He did not go into detail as to how it could be done except to say the union preferred to have it accomplished through collective bargaining.

Henry L. Nunn, president of the Nunn-Bush Shoe Co., also upheld the affirmative by stating that his company had actually accomplished the payment of a guaranteed annual wage to about 70 percent of its employes who are termed "permanent." He does it by setting aside a certain percentage of the estimated annual sales in dollars, as labor's share. This percentage he has found to be fairly constant through the years. Ordinarily it would be termed the expected annual labor cost. The percentage remains fairly constant although of course the amount would vary with the annual volume of sales.

The predetermined percentage based on an estimate of sales, is used as a drawing account for the permanent employes, from which they receive a regular weekly income whether they work full time or not. Once a month the estimate is recast and they receive the balance for the time actually worked, if it exceeds the guarantee. The company is unionized, but by an independent union, and the union has a member on the company's board of directors. This kind of a set up, Mr. Nunn believes, is the answer to labor problems, since it gives labor just as much interest in the company's prosperity as the stockholders and management have.

Those who opposed the proposition of guaranteed annual incomes for wage workers were not industrialists, but from the academic side—Merryle S. Ruykeyser, a financial writer for the newspapers and William Benton, vice-president of the University of Chicago. Their arguments were mainly that annual incomes could not be guaranteed wage workers unless someone also guaranteed their employers a certain amount of annual business, and also guaranteed a competent management to their enterprises. They also contended that any attempt to establish guaranteed annual incomes by law would cause unemployment because it would deter enterprisers from expanding their industries or starting new ones. They said business had too many ups and downs ever to make it possible to guarantee an annual income, and management should be left free to meet these fluctuations.

It did not seem to us that the latter arguments were any too sound. Mr. Ruttenberg did not advocate the government's forcing an annual wage on industry. His point was that the government could stabilize an industry, by determining its projected annual output, and the industry could provide a minimum annual income for labor on the basis of such estimates. The W.P.B. has kept such statistics during the last few years. What Mr. Ruttenberg did not say was how far the government would have to go in price-fixing and allocating business to the various companies in order to apply its statistics. He openly threatened, or maybe we should say predicted, that if industry did not find a way to do it, the government would step in and take over.

We don't think that is an idle threat, but one clearly in the picture for the future, if present trends continue. Many big industries, both on national and local scales, have been temporarily stabilized from time to time in the past by methods not always strictly within the spirit even if within the letter of the anti-trust laws. It seems possible that by close coöperation of government and industry, instead of constant contention, such stabilization could be brought about without too much government supervision as to details.

Of course the problem is difficult and Mr. Ruttenberg's example of the W.P.B.'s control of steel during war time is not very significant. It is one thing to allot a short supply by priorities, at a time when all producers are working to capacity, and another thing to allot business to producers when demand is far short of capacity production. Most of us believe such business awards would be more likely on the basis of politics than on a basis of business efficiency.

However, it is conceivable that contracts or bidding forms could be devised which would insure impartiality in the awards. In other words, we really think the problem is capable of solution, although probably not on a national scale. It could better be tackled by regional committees representing labor, industry and the public.

There is certainly much to be said in favor of stabilization for any basic industry, and while it may be putting the cart before the horse, agreements with labor to pay annual guaranteed incomes would tend to keep competitors in line and not to poach too extensively on other people's preserves. It would throw the light of publicity on all transactions. However, we mistrust that it would make the employer conservative about employing more people and would tend to make him reduce his "permanent" employes to a minimum. If it also increased the efficiency or productiveness of these employes it would likewise tend to reduce employment.

In those rock product industries largely dependent for orders on public works construction, the government, national and local, does largely, or certainly can, control the placing of orders for materials without any new laws, at times when the industries are "stabilized"—which is another way of saying when bid prices are uniform.

Nathan C. Rockwood

A PICTOGRAPH *of efficient dust distribution*

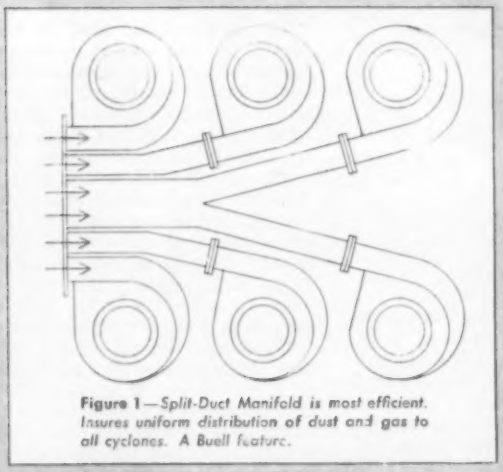


Figure 1 — *Split-Duct Manifold is most efficient. Insures uniform distribution of dust and gas to all cyclones. A Buell feature.*

THE MOST EFFICIENT METHOD ***(Buell's)***

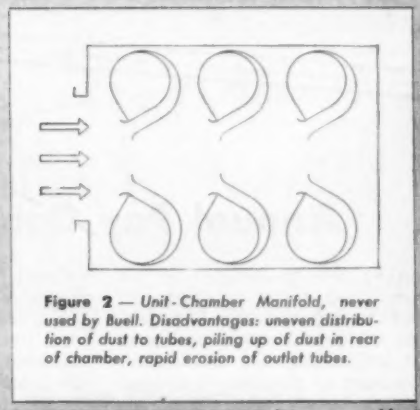
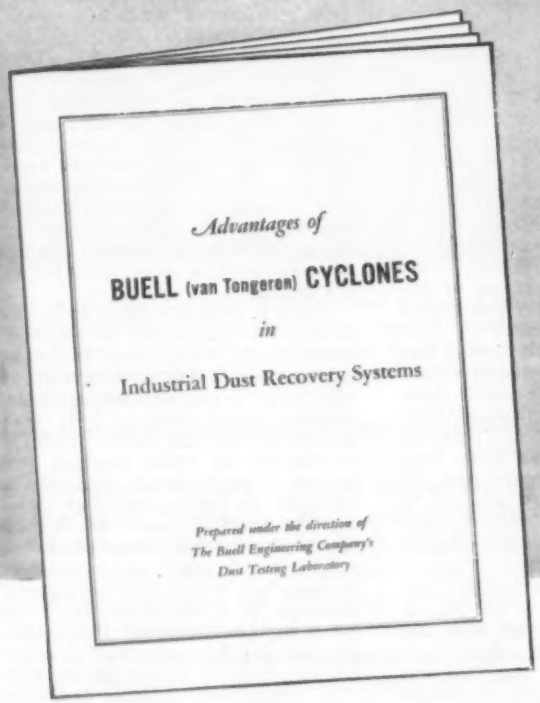


Figure 2 — *Unit-Chamber Manifold, never used by Buell. Disadvantages: uneven distribution of dust to tubes, piling up of dust in rear of chamber, rapid erosion of outlet tubes.*

THE LEAST EFFICIENT METHOD ***(Never used by Buell)***



BOTTOM VIEW OF MANIFOLD ASSEMBLY

Every engineer and operating executive should have a copy of the bulletin shown above as his guide in the selection of the right dust collection equipment.

Buell Design ELIMINATES CLOGGING MINIMIZES EROSION

The scientific development of inlet manifolding for multiple unit cyclone dust collectors has played an all important part in the uniform distribution of both gas and dust in cyclone collectors. How proper manifolding is achieved in Buell Dust Recovery Systems is shown in the pictograph on this page. What happens when the dust load is not uniformly distributed, and how serious these disadvantages may be, is best described in the bulletin shown on this page, from which these two manifold sketches were taken.

buell
DUST RECOVERY SYSTEMS

BUELL ENGINEERING COMPANY, INC.
Suite 5000, 2 Cedar St., New York 5, N. Y.
Sales Representatives in Principal Cities

DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

News ABOUT THE INDUSTRY AND PEOPLE

Phosphate Manager

ARTHUR CRAGO, formerly assistant superintendent of the U. S. Phosphoric Products division of the Tennessee Corp., Tampa, Fla., has been appointed manager of the phosphate rock production operations of the American Cyanamid Co., with headquarters at Brewster, Fla. Mr. Crago previously was manager of the Phosphate Recovery Corp. and of the Phosphate Mining Co. in Florida.

Research Organization

WALDEMAR F. DIETRICH, consulting mining and metallurgical engineer and formerly chief research engineer for the Kaiser Co., has joined G. H. MORSE, research and analytical chemist and owner of Morse Laboratories, in forming an organization to conduct investigative and research projects in the mineral and chemical industries. The name of the firm is Dietrich, Morse and Associates.

Meets with Accident

RALPH BOWSMAN, owner of the Bowsman Washed Sand and Gravel Co., Troy, Ohio, is suffering from a skull fracture, head injury, broken collar bone and bruises received in a truck accident at the plant. Mr. Bowsman's condition is reported slightly improved, but he remains in a serious condition.

Elected Director

WILLIAM A. ATKINS, president of the Metropolitan Sand and Gravel Corp., New York, N. Y., has been elected a member of the board of directors of the Indiana National Bank, Indianapolis, Ind., succeeding Jaquelin S. Holliday, who died recently.

Guest Speaker

CHARLES DUNN, superintendent of the Garnett Rock Co., Garnett, Kans., was guest speaker at a recent meeting of the Garnett Rotary Club. He gave a very interesting account of the rock formations in that vicinity and the methods of obtaining stone for commercial uses.

Manager of Sales

ROY T. GILES, service director, The Atlas Lumnite Cement Co., New York, N. Y., has been appointed sales manager. Mr. Giles formerly was chief engineer of concrete control for Blaw-Knox Co., Pittsburgh, Pa. He has spent much of his time in the development of refractory concrete which is used for lining furnaces and in other construction exposed to high temperatures. This use now constitutes a large volume of the present consumption of lumnite. Mr. Giles has written several articles on the subject, including a paper presented at the annual meeting of the American Ceramic Society.

Masonry Curing Committee

JAY C. EHLE, Cleveland Builders Supply Co., Cleveland, Ohio, has been named chairman of a committee appointed by the National Concrete Masonry Association to study curing methods in the interest of improving quality of concrete masonry units. BENJAMIN WILK, Standard Building Products Co., Detroit, Mich., and PHILIP PAOLELLA, Hamden Building Tile Co., Hamden, Conn., are serving on the committee. Each of these men has been giving special attention to the subject of curing and has been conducting extensive research individually. Several meetings have already been held and a definite program is under way to get to the answers for proper temperatures, etc., to improve quality and permit shorter curing periods.

Fluorspar Manager

EDWARD THORNTON of Silver City, N. M., is now general manager of the fluorspar plant of Edgar J. Marston, Deming, N. M.

Reckless

QUINT BEST, general sales manager, Consolidated Rock Products Co., Los Angeles, Calif., recently rode his horse "Reckless" at a fiesta in California in honor of Don Carlos Rincon Gallardo, Marquis of Guadalupe, Head Charro of all the Charros of Mexico. Mr. Best is vice-president of Los Charros, an organization descended from the gentlemen horsemen of Old Mexico that carries on the traditions of the old rancheros. He is also vice-president of the San Fernando Valley Horse Owners Association, and rides with the Los Rancheros Visitadores of Santa Barbara County, an internationally known organization of about 500 horsemen which each year rides from Santa Barbara into the heart of the Santa Ynez Mountains. "Reckless" was loaned to Mr. Best by his friend Robert Mullenback when he left for the Army.

Quint Best and his horse "Reckless" on parade

McCandless Sells Out

ROY MCCANDLESS, head of Cinder Block, Inc., Detroit, Mich., for many years, has sold his interest in the company to Henry F. Horn Fuel and Supply Co., of Detroit. Mr. McCandless, a past president and director of the National Concrete Masonry Association, has relinquished his activity in management and will serve in a consulting capacity for the company. HERB VINCENT and ART LEECE will continue active with the company in executive capacities.

Silica Manager

R. S. LEBOLD, has been made plant manager of the Michigan Silica Co., Rockwood, Mich., subsidiary of the Ottawa Silica Co., Ottawa, Ill., succeeding E. J. Beyer.

Becomes Manager

G. TOWNSEND HARLEY, assistant manager, International Minerals and Chemical Corp., Carlsbad, N. M., has been promoted to manager of the potash operations. He succeeds H. S. MARTIN, who has retired because of ill health.

Joins Penn-Dixie

NATE TRUCANO, formerly chemist with the Aetna Portland Cement Co., Bay City, Mich., is now chemist for the Pennsylvania-Dixie Cement Corp., Des Moines, Iowa.

Association President

JULIUS J. WARNER, of the Richter Concrete Corp., Cincinnati, Ohio, has been reelected president of the Ohio Ready Mixed Concrete Association.

In the Armed Forces

M. C. BROOKS, development engineer in the process-control department of Basic Magnesium, Inc., Dunning, Nev., has joined the U. S. Naval Reserve.

•

WILLARD P. FULLER, JR., geologist for Basic Magnesium, Inc., Gabbs, Nev., has been commissioned an Ensign.

Extensive Plant Improvements

BATESVILLE WHITE LIME CO., Batesvilles, Ark., Board of Directors, has reported near completion of a three-year improvement program which represented an investment of approximately $186,000. The program included the mechanization of the quarry, the redesign and rebuilding of the lime kilns, new conveyor equipment and other improvements throughout the plant. An unfinished part of the program is the installation of additional machinery for the production of agricultural limestone. New machinery, for that purpose, will be installed in the near future to yield a daily production of 1000 tons.

L. R. Myers, Little Rock, Ark., was re-elected president of the company and Lawrence Smith, Batesville, was re-elected secretary and treasurer.

Price Relief

INCREASES in ceiling prices for concrete masonry units are being granted in a number of areas, usually after extensive negotiation with OPA. A general increase of approximately 2 cents per unit has been granted in Sheboygan, Wis., to Sheboygan Brick Co., which was justified by the revised building code in the State requiring units to meet 1000 p.s.i. compressive strength tests. Schmidt Concrete Products Co., Topeka, Kan., had also been granted a price increase by OPA. Local producers in several other cities have on file applications for price relief under the hardship provisions of OPA regulations.

Western Phosphate

DR. H. A. CURTIS, general consultant for TVA, recently addressed the Middle Tennessee Technical Society on the subject of Western Phosphate deposits. Dr. Curtis was not too optimistic for the development of these deposits on a satisfactory commercial scale, principally because no large surplus water power was available near enough to the deposits to permit electric furnace development, which would limit production of treble superphosphate to the wet process.

Fused Phosphate Rock

PRODUCTION of fused phosphate rock will probably start early in 1945 at the new TVA plant at Godwin, Tenn. The product will have a content of 27.5 per cent P_2O_5 with only about 0.3 percent fluorine, making it a suitable substitute for bone meal.

Ship Ballast Bids

READY-MIX CONCRETE CO., Portland, Ore., submitted the low bid, $16.50 per long ton, for heavy aggregates in the form of concrete ballasting to be supplied for 20 AP-5 troopships being built by the Kaiser Co. at Vancouver, Wash. The bid was for 30,000 long tons at $495,000. Each troopship will require 1500 long tons to be delivered at the outfitting dock following launching.

Agstone Contract

INDEPENDENT GRAVEL CO., Joplin, Mo., has a contract to distribute 3000 tons of agricultural limestone in McDonald County. After the McDonald County contract is completed, the company indicated it would sell and distribute agstone to individuals at a price of around $3.00 per ton. The agricultural limestone is coming from the Carthage, Mo., plant.

Gypsum Survey

THE STATE OF MICHIGAN is making a geological survey of gypsum deposits in the Grand Rapids-Greenville area and in Arenac and Iosco counties in preparation for postwar development of resources in the State. Gypsum deposits will be mapped and classified as to crystallization and purity and studies of processing and marketing methods are to be continued.

Gypsum Labor Dispute

WAR LABOR BOARD remanded to the seventh regional WLB at Kansas City for reconsideration a section of the regional order which directed a standard voluntary maintenance of membership clause and check-off in a dispute between the United States Gypsum Co., at Kansas City, and the United Gas, Coke, and Chemical Workers of America, CIO. Labor members had dissented.

Sell Sand Plant

CHESHIRE WHITE QUARTZ SAND CO., Pittsfield, Mass., has been sold to George E. Emerson, contractor. The purchase included the plant and a tract of land about 1700 acres in area. This foundry sand company had been owned by the Dean family since 1876.

Adds Truck Equipment

GRAYSTONE CONCRETE PRODUCTS CO., Seattle, Wash., has added an additional delivery truck to its fleet of 12 units which include six flat bed, four semi-trailers, and two sand and gravel trucks. A carloader fork-type lift truck also has been purchased.

Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912, and March 3, 1933

Of ROCK PRODUCTS, published monthly at Chicago, Illinois, for November 1, 1944.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared Charles Hoefer, Jr., who, having been duly sworn according to law, deposes and says that he is the Business Manager of Rock Products and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher—Tradepress Publishing Corporation, 309 W. Jackson Blvd., Chicago 6, Ill.

Editor—Bror Nordberg, 309 W. Jackson Blvd., Chicago, Ill.

Managing Editor—Ralph S. Torgerson, 309 W. Jackson Blvd., Chicago, Ill.

Business Manager—Charles Hoefer, Jr., 309 W. Jackson Blvd., Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Tradepress Publishing Corporation, 309 W. Jackson Blvd., Chicago 6, Ill. The stockholders of the Tradepress Publishing Corporation are John R. Thompson, 2511 Coyle Avenue, Chicago; J. L. Frazier, 2043 Orrington Ave., Evanston, Ill.; Col. J. B. Maclean, 7 Austin Terrace, Toronto, Ont., Canada; Horace T. Hunter, 120 Inglewood Drive, Toronto, Ont., Canada; The Maclean Publishing Co., Ltd., 481 University Avenue, Toronto, Ontario, Canada.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is: (This information is required from daily publications only.)

CHARLES HOEFER, JR.
Business Manager.

Sworn to and subscribed before me this 17th day of October, 1944.

(Seal) M. E. JOHNSTON.

(My commission expires Oct. 20, 1945.)

Stone for War Plant

INTERCITY SAND & GRAVEL CO., Eugene, Ore., will supply 3500 cu. yds. of crushed stone to be laid for temporary roads to serve the construction of the immense Willamette Valley Wood Chemical Co. wood wastes alcohol plant at Springfield, Ore. This is a $2,250,000 plant.

New Agstone Plant

SULLIVAN LIME CO., Rogue River, Ore., has started carload shipments of agricultural limestone from its new plant.

Discontinues

ANDRES STONE AND MARBLE CO., Milwaukee, Wis., has discontinued the production of crushed stone for the duration of the war.

Synthetic Rubber Insulation

UNITED STATES RUBBER CO., New York, N. Y., has announced the development of Nubun, a synthetic rubber latex insulation for power, lighting and communication cable. Made by the latex continuous dip method, Nubun is said to have advantages over ordinary wire where replacement and space are important factors. Qualities of Nubun insulation listed by the manufacturer include flexibility, impermeability to water, laminated construction, and perfect centering of the conductor to produce an insulated wire of maximum conductivity and minimum diameter. Nubun insulation is made from a special modification of Buna S synthetic rubber.

Sand-Lime Brick Production and Shipments

FOUR active sand-lime block and brick plants reported for September and four for August, statistics for which were published in October, 1944.

AVERAGE PRICE FOR SEPTEMBER

	Plant Price	Delivered Price
Detroit, Mich.	.....	$17.00
Saginaw, Mich.	$15.00	.....
Grand Rapids, Mich.	.....	16.20
Seattle, Wash.	19.50	22.50

STATISTICS FOR AUGUST AND SEPTEMBER

	*August	**Sept.
Production	1,314,065	1,221,655
Shipments (rail)	25,000	385,000
Shipments (truck)	1,275,065	1,104,655
Stocks on hand	625,000	215,000
Unfilled orders	1,338,000	800,000

*Four plants reporting: incomplete, one not reporting stocks on hand and one not reporting unfilled orders.

**Four plants reporting: incomplete, one not reporting stocks on hand and one not reporting unfilled orders.

RECENT DIVIDENDS

Consumers Co. (Del.) $3 pfd. (p50) (arrears)	$1.50	Nov. 1
Kelley Island Lime & Transport Co.	.20	Sept. 30
Alpha Portland Cement Co.	.25	Dec. 21
Superior Portland Cement Co. "B"	.50	Oct. 28

Aggregates are raised by skip and dumped into mixer drum. Asphalt is admitted into mixer by gravity from drum above mixer

Concrete Mixer Unit for Bituminous Mix

NECESSITY has turned the inventive minds of producers in the rock products industry to the adaptation of equipment designed for one purpose to an entirely different function.

C. W. Blakeslee & Sons, Inc., New Haven, Conn., crushed stone and ready mixed concrete producers, found a new use for equipment which was designed primarily for mixing and elevating concrete. The mixermobile unit is widely used on the Pacific Coast and also in many other sections of the country for large concrete construction jobs, but the Blakeslee company has developed it into a convenient unit for producing bituminous mixes, another branch of its widespread activities.

The mixing operations are shown in the accompanying illustration. Aggregates for the mix are loaded from the stockpile into the skip of the mixermobile by crane. Here 10 lbs. of unslaked lime is added per ton of aggregates. The skip is dumped in the drum where it is mixed for one minute to coat the aggregate with the lime. The asphalt is then admitted by gravity from a steel drum above the mixer; Kotal having previously been added to the asphalt in the tank truck shown alongside. Kotal is said to have the property of making the asphalt coat the aggregate more effectively.

Mixing is continued for four minutes when a 3-ton batch is elevated and discharged into stockpile via the chute from the tower. The only heat used in the operation is a small steam jet into the mixer drum and heat of the asphalt.

In the summer an MC-5 is used for stockpiling, and in winter, under conditions illustrated, an MC-2 unit is employed. According to W. T. Gilbert, vice-president, the product may be laid in any weather as it is not affected by water. Mixing operations also can be carried on in winter weather.

Phosphate Shipments

SHIPMENTS of ground rock phosphate by Tennessee producers in 1944 will likely exceed 1943 shipments by 30 percent but will still represent less than 70 percent of total capacity. Manpower shortages and accidents are holding shipments down. Ground phosphate rock in bulk is finding increasingly greater acceptance by farmers.

Mica Prices

COLONIAL MICA CORP. has extended to March 31, 1945, the price guaranty commitments applicable to ruby mica only, upon recommendation of WPB. Prices of $8 per pound are being paid for full trimmed muscovite ruby sheet mica large enough to cut 1½ x 2 in. and 30c per pound for punch mica under the commitments. Other classes now covered by the price guarantees are being dropped.

Don't burn paper

SEND IT TO WAR

One Pound of Waste Paper Will Make 2 Blood Plasma Cartons for Life-Saving

ROCK PRODUCTS is cooperating with the War Production Board to conserve paper, so *Save this issue and Share it* with your friends in the industry.

Sand and Gravel Safety Contest

Trophies to sand and gravel producers having best 1943 safety records to be presented at convention of National Sand and Gravel Association in New York in January

WINNERS of the 15th annual safety contest conducted by the Bureau of Mines and the National Sand and Gravel Association for 1943 are the Dravo Corporation's Pittsburgh River plant at Pittsburgh, Penn., and the Dixie Sand and Gravel Corporation's plant at Chattanooga, Tenn. Competing against 62 other plants producing sand and gravel in 19 States, these companies were awarded trophies provided by ROCK PRODUCTS for the best safety records achieved in each of two groups of operations during 1943.

The Pittsburgh River plant, operating 223,938 man-hours without a disabling injury, led the group which worked 100,000 or more man-hours, while the Chattanooga plant, with 64,376 man-hours, had the best record among the many plants operating less than 100,000 man-hours without a disabling injury. The 64 competing plants operated a total of 4,028,327 man-hours with an accident-frequency rate of 33.51 and an accident-severity rate of 10.74. In all, 18 plants operated throughout 1943 without a disabling injury.

Ordinarily, all plants other than the trophy winners which maintain accident-free records for the entire year are awarded Certificates of Merit. Awarding of certificates has been suspended for the duration of the war, but the following plants fulfilled the requirements for certificates by posting perfect safety records for 1943:

Chelsea lake plant, Memphis, Shelby County, Tenn., operated by the Missouri Portland Cement Co., 145,962 man-hours.

Price river plant, Price, Tulsa County, Okla., operated by Chandler Materials Co., 30,063 man-hours.

Hawarden wet-pit plant, Hawarden, Sioux County, Iowa, operated by L. G. Everist, Inc., 27,303 man-hours.

Thomas dry-bank plant, Thomas, Tucker County, W. Va., operated by Fairfax Sand and Crushed Stone Co., 25,086 man-hours.

Delavan dry-bank plant, Delavan, Walworth County, Wis., operated by J. F. Thorpe Co., 23,753 man-hours.

Muskegon dry-bank plant, Muskegon County, Mich., operated by Nugent Sand Co., 19,605 man-hours.

Kalamazoo dry-bank plant, Kalamazoo, Kalamazoo County, Mich., operated by American Aggregates Corp., 17,059 man-hours.

Trenton dry-pit plant, Barneveld, Oneida County, N. Y., operated by Eastern Rock Products, Inc., 15,535 man-hours.

Lincoln river plant, St. Albans, Kanawha County, W. Va., operated by Zenith Sand Co., 15,409 man-hours.

Edgerton dry-pit plant, Edgerton, Rock County, Wis., operated by Edgerton Sand and Gravel Co., 13,988 man-hours.

Bedford wet-pit plant, Garfield Heights, Cuyahoga County, Ohio, operated by Schmidt Bros. Sand & Supply Co., 12,269 man-hours.

Warren river plant, Warren, Warren County, Pa., operated by General Concrete Products Corp., 11,532 man-hours.

Fort Gay river plant, Fort Gay, Wayne County, W. Va., operated by Laval Sand Co., 11,371 man-hours.

Titusville dry-bank plant, Titusville, Venango County, Pa., operated by Curry Sand & Gravel Co., 9,091 man-hours.

Muskogee No. 2 river plant, Muskogee, Muskogee County, Okla., operated by Pioneer Sand & Gravel Co., 5,873 man-hours.

Sterling Creek No. 3 river plant, Sterling Creek, Herkimer County, N. Y., operated by Eastern Rock Products, Inc., 5,114 man-hours.

All sand and gravel plants are eligible to enter these contests. A company may enroll one or more plants, but a separate enrollment application should be filled in for each plant. Application blanks may be obtained from the Bureau of Mines, Washington 25, D. C. After enrollment the only requirement is that companies send to the Bureau a monthly report of man-hours worked and a complete report of each lost-time (disabling) injury. Accident-report forms supplied by the Bureau or copies of reports sent to the State Commission or insurance carrier may be used in reporting accidents.

CONVENTIONS COMING

American Institute of Mining and Metallurgical Engineers, Annual Meeting, Pennsylvania Hotel, New York, N. Y., February 18-22, 1945.

Highway Research Board, National Research Council, Annual Meeting, Netherland Plaza Hotel, Cincinnati, Ohio; postponed indefinitely.

National Chemical Exposition and National Industrial Chemical Conference, Chicago Coliseum, Chicago, Ill., November 15-19, 1944.

National Exposition of Power and Mechanical Engineering, Madison Square Garden, New York, N. Y., November 27 to December 2, 1944.

National Industrial Sand Association, Meeting, Palmer House, Chicago, Ill., November 19, 1944.

National Ready Mixed Concrete Association, Annual Meeting, Hotel New Yorker, New York, N. Y., January 24-26, 1945.

National Sand and Gravel Association, Annual Meeting, Hotel New Yorker, New York, N. Y., January 23-25, 1945.

Cement Production

BUREAU OF MINES reports that production of finished portland cement during August, 1944, totaled 9,003,000 bbl. or 23 percent below production in August, 1943; a further easement in the monthly rate of decline which was 28 percent in July, 34 percent in June and 50 percent in January. Another indication of the improved position of the industry was the gain in production during August over July, 1944, which was larger proportionately than the usual seasonal gain between these months.

Mill shipments during August, 1944, totaled 10,758,000 bbl. or only 15 percent below the quantity shipped in the same month of 1943. This was a sharp easement in the monthly rate of decline from the 25 percent decrease noted in July, 1944, and was a lower rate than in any other month since April, 1943. Also, the August shipments exceeded production by approximately 1,375,000 bbl. As a result, stocks of finished cement at mills on August 31 declined to 18,478,000 bbl. or 9 percent below those of July 31. The end-of-August stocks were well below the 25,000,000 bbl. level of February 29 and March 31, 1944.

The following statement gives the relation of production to capacity, and is compared with the estimated capacity at the close of August, 1944, and of August, 1943:

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	Aug. 1943	Aug. 1944	July 1944	June 1944	May 1944
The month	56.0	44.0	41.0	40.0	35.0
12 months	64.0	40.0	41.0	43.0	44.0

Silica for Alloys

STENSTROM BROTHERS, mining contractors of Spokane, Wash., are shipping out more than four carloads of silica from a Chewelah, Wash., plant to supply the Ohio Ferrous Alloys Co., plant at Tacoma.

Air-Entraining Cement Manufacture

Some practical observations and opinions on the addition of dry or neutralized vinsol resin to portland cement at time of grinding

By J. F. BARTON*

WHEN VINSOL RESIN first came into general usage by portland cement manufacturers it was added by intergrinding the dry powder with portland cement clinker. The early feeding problem with this material is too well known by all who have been called upon to make vinsol resin cements according to the earlier specifications.

The use of neutralized vinsol resin "vinsol resin dissolved in aqueous solution of caustic soda or caustic potash" for intergrinding with portland cement clinker is a later development. Manufacturers have had high hopes that the use of neutralized vinsol resin would aid in overcoming the feeding problem encountered when feeding dry vinsol resin. Perhaps the solution form of addition will solve the shrinkage problem, "loss of dry resin in the grinding system," due to the fact that resin in liquid form should coat the cement particles more readily therefore they cannot be drawn, when liquid, out of the system by the dust collecting fans.

I cannot say from experience whether or not this theory holds in practice. A study of the grinding systems over which I have had supervision has not revealed a loss of dry vinsol resin, therefore, I have nothing on which to base a comparison. I have, however, had the opportunity to study the problem of addition of both types of vinsol resin within the past three months while manufacturing a considerable quantity of A.S.T.M. EA—C 150 Type II and A.S.T.M. C 175—44 T Type IIa portland cements ground from the same run of clinker. I believe it timely to report my observations because I believe the uniformity of proportioning of vinsol resin with portland cement clinker has as much to do with the alkali, vinsol resin reaction and its effects on air-entrainment as the alkali reaction itself.

W. J. McCoy[1] expresses the theory, "It would seem that the air-entrainment of a cement does not depend on the amount of vinsol resin present, but on its availability which varies with the nature of the finish grinding of the cement." It is my observation that availability varies with the degree of dispersion of the resin in the grinding system. The degree of dispersion may well depend on a uniform continuous proportioning of the resin with the clinker feed.

Advantages When Feeding Neutralized Vinsol Resin

1. It is a liquid and feeding can be accurately controlled.

2. Economic advantage. Requires about one-half the quantity required when feeding dry resin.

3. Good dispersion evidenced by uniform air-entraining reaction. There is no apparent loss of resin from the grinding system.

4. Acts as a mild grinding aid.

Disadvantages When Feeding Neutralized Vinsol Resin

1. Requires special mill supervision by laboratory control staff.

A—Requires supervision of the mixing of the solution.

(a) Average mill operator cannot be trusted with this important detail. Our operators were afraid of the sodium hydroxide and refused to handle it.

B—Too much mixing supervision is expended if batches of less than 100 gal. are mixed at each time. A 100 gal. batch requires 1½ to 2 hours of supervision. Actual mixing time is approximately 1½ hours. After the first batch is mixed and passed on to the feeding reservoirs each succeeding batch is influenced somewhat by a small quantity of the preceding batch which does not thoroughly drain from the bottom of the central mixing drum. The influence exhibited is in the form of a froth which develops when water is added to the drum to start a new batch. It requires at least 45 minutes of mixing in a slightly caustic solution to reduce the froth to liquid before the vinsol resin can be safely added.

C—The caustic soda solution which is made up separately becomes extremely hot when mixing. Care must be exercised in adding this to the main batch to prevent the hot caustic from burning the resin. Too much time would be consumed in allowing the caustic solution to cool normally. Special cooling arrangement for the caustic solution could be provided.

D—The vinsol resin is supposed to dissolve completely in the caustic alkali solution, however, there is a tendency toward the formation of a resinous sludge on the bottom of the feeding reservoirs unless the solution is kept in circulation. This can effect the concentration of the solution and reflect amount of resin addition.

E—Flake vinsol resin does not go into solution readily. If one has only flake resin on hand he will do well to grind it before attempting to make neutralized vinsol resin.

F—Agitation or mixing must be done with a mechanical agitator when dissolving the resin in the alkali solution. Compressed air should not be used for obvious reasons.

G—Special measuring equipment "volume" must be provided, maintained and calibrated regularly for use in checking the neutralized resin feed rate.

2. Accuracy of proportioning is dependent on the accuracy of the clinker and gypsum feed rate.

3. A 10 percent solution raises the loss on ignition 0.3 percent when feeding neutralized vinsol resin at the rate of 0.013 percent.

Advantages When Feeding Dry Vinsol Resin

1. The powder or flake can be fed mechanically at a high degree of accuracy.

2. The dry resin requires no mixing or special handling other than special feeding equipment.

3. After original settings are made by the laboratory control staff a minimum of mill supervision is required.

A—Mill operators can and will

*Chief chemist, Federal Portland Cement Co., Inc., Buffalo, N. Y.

[1] Investigation of the Air-Entraining Properties of Portland Cements Effected by the Addition of Vinsol Resin. A.S.T.M. Bulletin—March, 1944—Page 22.

(Continued on page 112)

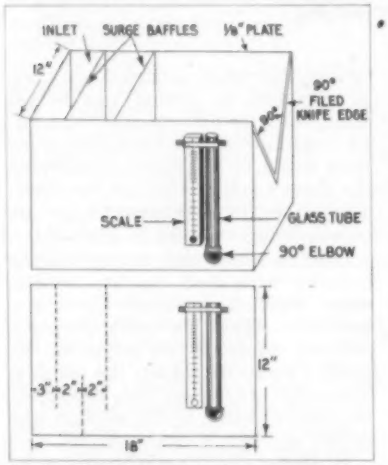
HINTS *and* HELPS

Practical Ideas Developed by Operating Men

Portable Weir

By JOHN F. PRUYN

MANY OPERATIONS have to check the amount of water flowing from their wells, collecting box, springs,



Details of portable weir for measuring flow of water from wells, springs, etc.

and various other points. This measuring is often done with a watch and a 5-gal. can.

A simpler, faster, and more accurate measurement can be made with the home-made weir shown in the sketch. This weir has been used at a large dolomite property in Utah. The weir scale can be calibrated to read in inches, gallons per minute, cubic feet per minute, etc. The method of calibration is as follows:

1. Using a source of water controlled by a valve, regulate the flow of water over the weir until it fills a 5-gal. can in one minute, or other time interval.

2. When 5 gal. per minute flow steadily, record the scale reading (inches).

3. Adjust the water to read 10 gal. per minute, and record the scale reading in inches.

4. After several readings are made, plot the results on graph paper. Intermediate points may then be picked off.

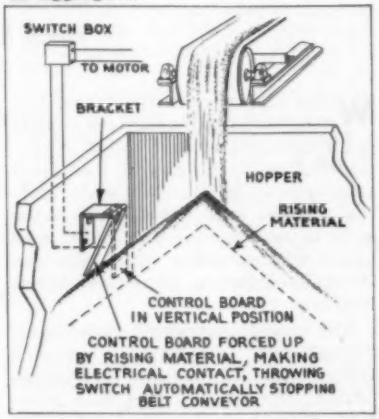
Automatic Bin Control

ERIE MATERIALS CO., Fort Wayne, Ind., has introduced novel ideas into its ready mixed concrete operations which have enabled the company to increase the efficiency of its methods of production and save time and labor.

One idea concerns a series of five electrical switches located in the tunnel which houses the blending conveyor belt. This belt charges the five-compartment Butler bin by feeding a hopper which serves a bucket elevator feeding the bin. Each compartment of the bin has a diaphragm located near the top which is connected to one of the switches in the tunnel. When a compartment is being charged, the switch controlling the diaphragm in that compartment is thrown in. When the bin is full, the aggregate pressing against the diaphragm causes electrical contact.

Originally, this contact would light a red lamp in the tunnel, informing the operator that the bin was full, whereupon he would change the swivel chute to load another compartment and throw in the corresponding switch for that compartment. The arrangement of this system was changed so that when contact is made by the diaphragm, electrical power to the belt conveyor is discontinued, thereby stopping the conveyor. This eliminates the necessity of having the operator remain at the switches, allowing him to proceed with other work. When the conveyor stops, he returns and makes the necessary changes to charge another compartment.

Another unique device in use at this plant is a paddle wheel connected to the wall above the hopper which charges the bucket elevator. This hopper has a grate which catches any oversize material. In the event that the grate should get plugged, the aggregate being fed from the belt conveyor would pile up and overflow the hopper. To prevent this, the paddle wheel is placed on the side of the hopper above the point where the aggregate would normally reach. In the event that the grate becomes plugged, the aggregate filling the hopper would press the paddle wheel against an electrical contact which in turn would shut off the belt conveyor. This obviates the necessity of having an operator at the hopper to watch the flow of aggregate.


SWITCH BOX
TO MOTOR
BRACKET
HOPPER
RISING MATERIAL
CONTROL BOARD IN VERTICAL POSITION
CONTROL BOARD FORCED UP BY RISING MATERIAL, MAKING ELECTRICAL CONTACT, THROWING SWITCH AUTOMATICALLY STOPPING BELT CONVEYOR

Sketch showing simple contact control switch to shut off conveyor belt when bin compartment is full

A complete article on the operations of this plant appeared on page 89 of the February, 1942, issue of ROCK PRODUCTS.

Kiln Charging Hopper Safety Chain Guard

CHARGING HOPPERS of some types of lime kilns present a minor hazard as they are often in charge of a man working alone, and they are constructed, of necessity, with a large opening into the kiln.

Safety chains hung loosely across the hopper, about 12 in. apart, as shown in the illustration, reduce the danger without in any way interfering with the free flow of stone into and out of the hopper.

Safety chains, placed 12 in. apart, over lime kiln charging hopper protect workmen

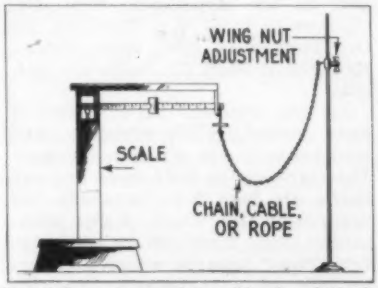
It will be found that where the chain is free to swing when stone falls on it, it will last indefinitely, but that stone falling on the chain at the point of anchorage will exert a definite shearing effect. It is therefore necessary to protect the chain at the point of attachment by a cover plate or by other means, unless the ends are carried to a position where they cannot be struck by falling stone.

Speeding Up Sample Weighing

By J. F. PRUYN

WHERE many samples must be weighed each day, much time may be saved by using the simple arrangement shown in the sketch for subtracting tare weight of weighing pans.

Several operations have found this simple device a great saving in time. The war has made it difficult to get pans of equal weight and unskilled men often slip-up on this tare weight.



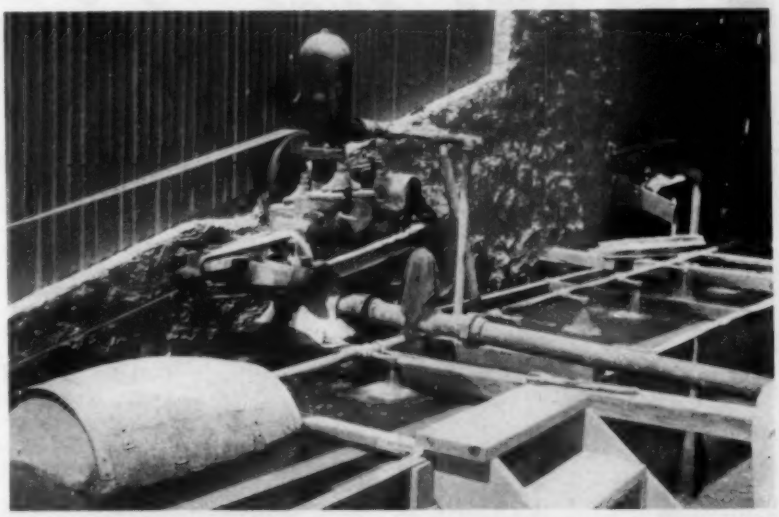
Use chain arrangement to subtract weight of weighing pans

Another simple use of this rig was seen at a plant that had to make several screen tests per day. Their original practice was to weigh a complete series by progressively adding each screen product on top of the other weighings. The number of errors and many minutes were saved by following almost the same practice except the "chain" (shown in the sketch) was adjusted to make the scale read zero after each weighing. The actual weight of each product was recorded and no further calculation was necessary.

Cooling Tank

SHOWN in the accompanying illustration is a home made tank containing cooling water for a 183-hp. Fairbanks, Morse Diesel motor. This motor provides power for the entire screening and crushing plant of the Beyer Crushed Rock Co., Kansas City, Mo.

The tank, which is 25 ft. long, 4 ft. wide, and 4 ft. deep, contains ¾-in. coil pipes which lead to the motor. A pump draws water from a nearby stream through a 3-in. pipe



Tank supplying cooling water for 183 hp. Diesel engine. Pipe over tank has seven spray units for cooling tank water

and discharges it to a 1½-in. pipe which is fitted with seven spray nozzles. This pipe is located directly above the tank and has one end fitted into a barrel which acts as a surge tank to dissipate the force of the water being pumped into the pipe.

Thermostatic control keeps the water in the tank at or below 100 degrees F. at all times. When the heat from the motor raises the temperature above this point, an automatic control starts the pump and opens the spray nozzles for charging the tank with cool water from the stream. At the same time, the tank discharges through an overflow pipe which takes the warmer water back to the stream through an underground drain tile. After the temperature has been reduced sufficiently, the pump stops and the spray nozzles are closed.

Gas Sampling

By J. F. PRUYN

MANY rock products operations must take samples of gases and liquids as a process control. Because of the expense of the usual commercial sampling apparatus or the present inability to obtain it, many plants either do without any close sampling control at all or merely take grab samples.

This simple apparatus shown in the sketch has been used with great success by a large cement producer in California and in smaller kiln operations in Utah.

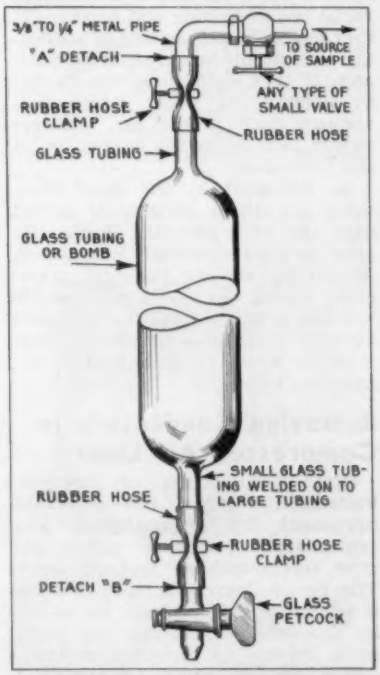
The apparatus may be used to take grab samples or continuous (8 hours or more) samples of either gases or liquids. Fundamentally the apparatus works on the principle of filling a closed receptacle with a liquid; the liquid is allowed to bleed out slowly and thus draw a sample of gas from the main or flue, etc. In more detail the apparatus works as follows:

1. The large glass or metal tube (bomb) is detached at "A" in the sketch.

2. The bomb is filled with water, salt water or mercury depending on the substance to be sampled.

3. Reattach the filled bomb; turn the upper valves to allow the gas or liquid sample to enter the bomb.

4. Adjust the glass petcock so that it will drip or bleed out the original liquid (mercury or water) of the bomb in an alloted time. As the water or mercury drips out, the bomb is slowly filled with a sample of gas or liquid.

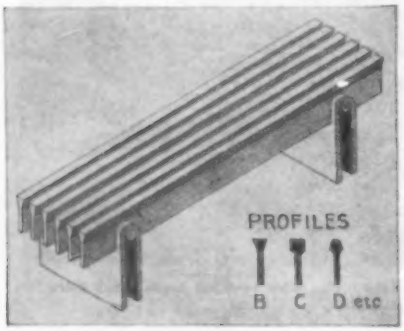


Apparatus to take continuous samples of gases or liquids

NEW *Machinery*

Wedge-Slot Screen

HENDRICK MANUFACTURING CO., Carbondale, Penn., is now in production on a wedge slot screen. This screen, as shown in the illustration, is made



Section of wedge-slot screen and cross sections of three types of screen profiles

of wedge-shaped profile bars held in position by U-shaped holders. Made for both wet and dry screen operations, the wedge slot screens are produced in a number of different bar sizes, bar profiles, and assemblies. They are made to fit all types of equipment, both flat and curved, stationary and moving, and any slot opening can be supplied.

Three advantages are claimed for the wedge slot U-supports: (1) they furnish required screen support by variations in spacing and height; (2) they maintain slot spacing by anchoring each profile bar in separate slots; and (3) they maintain screen rigidity by holding the rivets, which pass through each profile bar, and are tightly held inside the curved top of the U-support.

As indicated in the illustration, there are three profiles of screen bars, (B), (C), and (D). Profile (B) gives maximum capillary action with its sharply tapered head for maximum dewatering efficiency; profile (C) has a square head for increased abrasion resistance but taper from head to lower flange increases dewatering efficiency.

Removing Condensate in Compressed Air Lines

SELAS CORPORATION OF AMERICA, Philadelphia, Penn., has developed equipment for automatically and continuously removing condensate from compressed air and gas lines. The device, known as Liqui-jectors, is adaptable to pipe lines up to 1¼ in. pipe size and normal line pressures. No moving parts are involved; water removal being accomplished through two porous ceramic tubes, one inherently water-repellent, the other water-permeable but air-impervious.

The equipment is said to be in use in connection with pneumatic tools, atmosphere gas generators, compressors, air-actuated control systems, vapor quench lines, spray and blast equipment, and other pneumatic apparatus in which moisture may corrode the equipment or damage the work.

Automatic equipment for removing water from compressed air pipe lines

Compressed air entering the Liqui-jector passes through the first (and water-repellent) tube where it is stripped of moisture. The action is by coalescence of droplets on the surface of this tube, a coarse ceramic material with an average of 50,000 pore openings per square inch, each so small that the pressure drop across the tube is insufficient to permit water passage against the resisting diaphragm-action of its surface tension. The coalesced moisture drops to the bottom of the unit where it passes through the second tube (without loss of air) to outside atmosphere. This second tube is constructed of micro-porous porcelain, with an average of 720 million pore openings per square inch, and (being constantly wet by its wick action) constitutes a perfect air seal up to the rated limit working pressure of the unit.

Model A-150-1, shown in the illustration, accommodates lines up to ⅜-in. pipe size with line pressures up to 100 p.s.i

Apron Feeder

PIONEER ENGINEERING WORKS, INC., Minneapolis, Minn., has been authorized by the Kensington Steel Co., Chicago to build and distribute the Oro manganese steel apron feeder. Kensington Steel Co. holds the patents.

All the wearing parts, including pans, rollers, chain bushings, and sprocket teeth are of manganese steel. The sprockets on both head and tail shafts are built with reversible and renewable teeth made of Oro manganese steel. They can be easily reversed and replaced without removing the sprocket centers from the shaft or disconnecting the pans.

Sizes range from 30 in. to 60 in. wide; lengths vary from 6 ft. to 25 ft., depending on the installation. The pitch of the pans is 6 in. and 9 in. on the small feeders, and 12 in. and 15 in. on the larger feeders.

Feeding ore from a loading pocket onto a vibrating scalping screen

Convertible Shovel

KOEHRING Co., Milwaukee, Wis., has announced a ½-cu. yd. shovel which is convertible to crane, dragline or pull shovel. It is also available mounted on rubber tires for use as a cruiser crane, and can be furnished for truck mounting. This new post-war model will be known as Model 205, and will be available when present military needs are terminated.

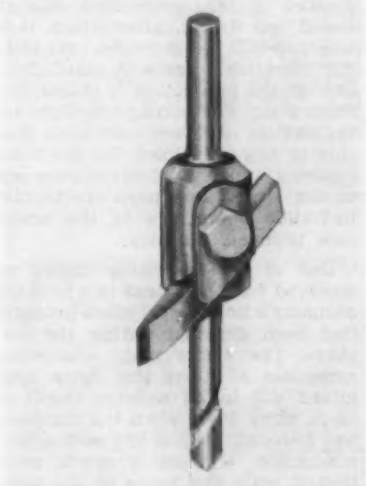
Shovel of ½-cu. yd. capacity convertible to crane, dragline or pull shovel

Design improvements include: same boom for shovel or pull shovel operation; rapid dipper trip; independent unit traction gear case; easily removable machinery units; instant travel reverse; head room in all parts of cab.

Hole Cutting Tool

BRUNO TOOLS, Beverly Hills, Calif., has developed an all-purpose adjustable hole-cutting tool to cut smooth holes in wood, steel, brass, hard rubber, aluminum, fiber or plastics. Two sizes are available, each equipped with an easily resharpened high speed steel blade. One model cuts holes to any diameter from ⅝-in. to 1¼-in. through ⅛-in. thickness. The other model covers all expansions from 1- to 2½-in., through thicknesses up to ⅜-in. These tools are designed to operate in light drill presses, portable drills, or breast drills and are also available with square shanks for use in hand braces.

The hole cutter consists of a drill which starts the hole and also serves as a pilot for the tool, a hardened body with a milled slot into which is set a specially ground high speed steel tool bit, and a hardened and ground shank. Adjustment is obtained by loosening the hexagon bolt which holds a firm locking clip, and sliding the blade to the correct distance from the pilot.



Adjustable hole cutting tool

Rapid Water Analysis

CHIEF CHEMICAL CORPORATION, New York, N. Y., has developed what has been trademarked as the Aero-Titrater. This apparatus furnishes the plant operator and laboratory technician with a rapid, precise method for the determination of hardness, calcium and magnesium in waters, both industrial and portable.

Apparatus to make rapid water analysis

It is said that false endpoints are absent, and air agitation eliminates tedious and arm breaking shaking by hand. The accuracy is comparable with lengthy and laborious gravimetric methods, and substances ordinarily present in water do not interfere.

The machine makes use of a new endpoint, based on the foam-meter principle. Determinations are made within 10 minutes and there is no waiting time to observe stability of lather. The ratio of calcium and magnesium present does not affect the determination; there is a single endpoint for stoichiometrically equivalent quantities of calcium and magnesium, regardless of the relative amounts present in the water.

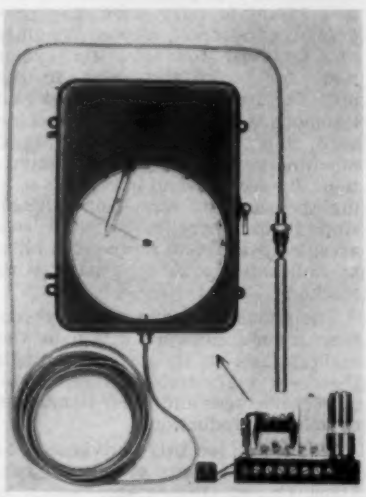
Samples of 50 ml. or less are required. This is in contrast with gravimetric methods involving evaporation of one-half liter or more and subsequent precipitation waiting periods. The Aero-Titrator can be used for micro determination of calcium and magnesium in boiler scales, minerals, plant ash, rocks, sediments and similar materials.

Electronic-Type Controller

THE BRISTOL COMPANY, Waterbury, Conn., has announced the production of a free-vane electronic controller which operates on the shielding effect of a vane passing between two coils in an electronic circuit. Recording and indicating models are offered for automatic control of temperature, pressure, liquid level, and humidity. The following types of control operation are available: low-open, high-open, low-high, low-open-high, and low-normal high.

This temperature controller is offered in ranges from —125 deg. F. to +1000 deg. F. for use in conjunction with motor and solenoid valves, relays, main line switches, and other fuel control apparatus for controlling the temperature in electric, oil, gas-fired, and steam-heated ovens, dryers, dehydrators, oil baths, tanks, and other similar industrial apparatus.

The pressure controller is available in ranges from full vacuum to 6000 p.s.i., and in addition is obtainable for automatically controlling liquid level. The humidity controller operates from a wet and dry bulb type of element with separate control for each bulb. The free-vane electronic controller may also be used as a time-program controller for automatically controlling temperature, pressure, liquid level or humidity, according to a definite time schedule.



Electronic principle operates controller

Excavation

Relay pump house in sub-pit. Note settling pond on left. Present workings through tunnel, lower right, into another area. Long pipe line, lower right, is to main pump relay station on upper level

Mining Silica Hydraulically

Ottawa Silica Co. employs jets and rubber-lined pumps to transport silica through pipe lines from deposit to plant

By BROR NORDBERG

INDUSTRIAL SAND'S role in the war effort has been exceedingly important in a long list of applications for which there are no substitutes. To mention but a few of its vital uses, industrial sand is being used in the manufacture of glass, aluminum and magnesium foundry work, the production of aircraft, airplane engines and in steel foundries for armor plate for tanks and ships, in the manufacture of Diesel engines and locomotives, for making machine tools, ship propellors and all types of machinery for producing ammunition. Its use for sand blasting is saving thousands of man-hours in the ship yards where it formerly was accepted practice to scrape ship hulls by hand and to burn off paint with torches.

The industrial sand industry has been maintaining production at the highest level in its history through these war years despite serious manpower shortages and other handicaps to volume production.

We were recently privileged to visit the operations of the Ottawa Silica Co. at Ottawa, Ill., which is one of the country's outstanding producers of high grade silica sands. It was our purpose to see how one of the largest tonnage producers had adjusted and enlarged its production facilities to meet the increased demands of war industries.

Back in 1939, the company had started to increase its production capacity and now is maintaining an average production of 5000 tons per day, which is nearly double pre-war figures. This increase in productive capacity involved all the separate operations essential to the production of a variety of industrial sand products. Excavating capacity was increased from an average of approximately 380 t.p.h. of silica sand delivered into the wash mill bins, in 1940, to over 700 t.p.h. in 1943. Wash mill and drain bin capacities had to be enlarged proportionately and also the drying and dry screening capacities.

With the exception of the mining operations, no new principles were involved in the expansion of mill facilities that are not standard practice throughout the Ottawa district. Sand is delivered through pipeline from the mine into the wash bins where great volumes of wash water are added and the impurities, mostly clay, are floated off. The sand is then drained in bins and dried through steam coil dryers, after which it is screened into many grades over electric vibrating screens. A small fraction of the production is milled into silica flour. The mining practices are the subject of this article since they employ new principles, for the silica industry, and since they comprise one of the largest and most spectacular hydraulic operations in the entire rock products industry.

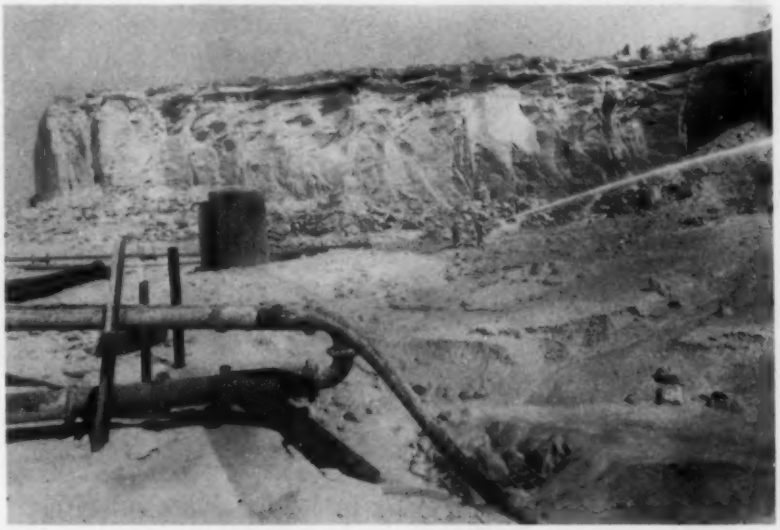
One of the surprising things we observed was the extent to which the company's holdings in silica property had been depleted during the war years. The entire main excavation comprises 87 acres that have been mined out to an average depth of 60 ft. since 1900, when the company was founded. During the early years, production was on a much more modest scale and many of the present day applications for industrial sand has not yet been developed.

Depletion inventories are taken July 1 of each year. Between July 1, 1942, and July 1, 1944, the depletion was 12.04 acres to an average depth of 70 ft. In addition, subpit operations have been developed to a 112-ft. level down to limestone bedrock and 6.49 acres have been mined to this level between July 1, 1942, and July 1, 1944. The company holds large reserves, but such a high rate of depletion will inevitably lead to higher transportation costs through pipelines in years to come.

Silica is one of the most abrasive materials known, yet it is being pumped and transported through thousands of feet of pipelines in preference to any other method of transportation. The nature of the deposit and the details of operation, discussed later in this article, explain why hydraulic operation is most practical. Hydraulic methods were adopted in the Ottawa district years ago at the working faces and, until recent years, wet drag conveyors lifted the sand out of the mine to the mills.

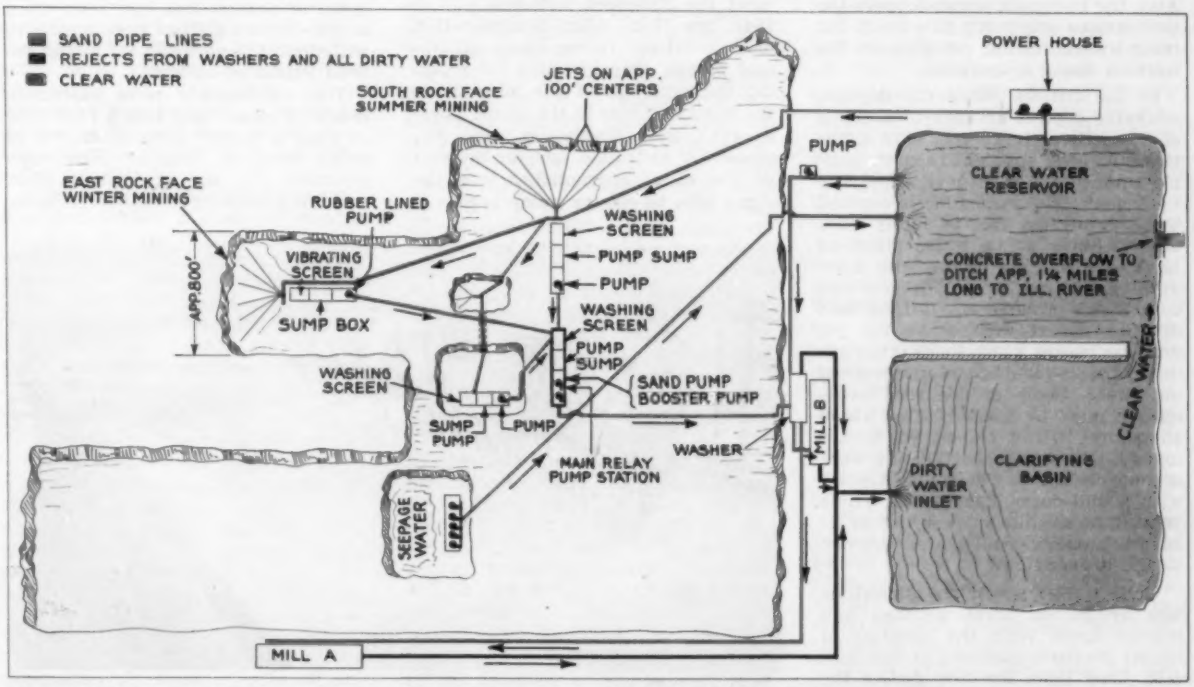
The scope of the Ottawa Silica Co. mine operations can best be realized by pointing to the large volumes of water and sand that are handled and transported. As much as 1500 tons of water plus solids are delivered to the wash mill bins in a single hour and 6000 g.p.m. of fresh water are delivered into the mine for hydraulicking and excavation.

Reservoirs covering 110 acres are kept full of clear water and there are pumps down in the mine capable of handling in excess of 13,000 g.p.m. of seepage water, which is the source of water for the mining and washing operations. Wash water is delivered into the mill at the rate of 6650 g.p.m. The foregoing round figures are mentioned to emphasize the enormous pumping capacities and power necessary for excavation, plant delivery and washing in a large silica plant of this type.



Close-up of a jet which moves silica to pump relay station. In the background may be seen monitor used to excavate silica under high pressure

Ottawa is known the world over for the high quality of its silica sands and is often referred to as the glass sand center of the world. The deposits are of St. Peter sandstone which outcrops in the Ottawa district, or are close enough to the surface to be mined by open pit methods. They are sea-borne deposits laid down upon a layer of limestone bedrock during the Ordovician geologic period and are said to extend to a thickness up to 275 ft. in places. The sand grains become smaller in size at



Schematic plan drawing of mining operations. For sake of clarity, overflow settling ponds at each relay pumping station not shown, and clear water lines (blue) paralleling each of the radiating jet sand lines (red) have been omitted. Mine covers 87 acres, and water reservoirs on right 110 acres

W. Small, foreman, demonstrating the ease with which monitor can be operated

the lower levels. The sand is extremely white and the sand grains are held together by clayey material. When thoroughly washed and processed, the finished product will test 99.89 percent SiO_2.

Hydraulic methods are utilized because the sandstone generally disintegrates into separate grains without the use of crushers. Much of the disintegration is accomplished by playing high pressure water streams from monitors into previously blasted down material and much of the necessary washing out of the clay is accomplished in this way at the face. Also, the hydraulic water delivers the sand grains into sump pits ready for relay transportation. Mobility at the working faces is essential.

In the Ottawa Silica Co. deposit, workable deposit extends to a depth of approximately 112 ft., with a 70-ft. main level supplemented by sub-pit mining to a 42-ft. level below the main floor. The sandstone is covered by three or four feet of sandy loam and, in some areas, by as much as 12 ft. of a mixture of clay and dolomite. Loose overburden is removed by a Diesel-powered K 370 Link-Belt Speeder shovel with a 1½-cu. yd. dragline bucket which loads into end-dump trucks for disposal into worked out areas. Some of the rock overburden must be blasted, after which the shovel with a 1¾-cu. yd. bucket loads it into the trucks. Cleanup work is done by a D-7 Caterpillar tractor with a bull-dozer attachment. Three White trucks and a Mack, all of 3-cu. yd. capacity, haul the overburden to the disposal pits.

Until recent years, the sandstone was drilled on three benches and blasted down. With the adoption of higher pressure monitors at the face, 6-in. blast holes are now drilled the full length of the face with a 27-T Bucyrus - Erie caterpillar - mounted electric blast-hole drill. Hydraulicking with water under 175 p.s.i pressure at the monitor nozzle tip disintegrates considerable of the chunks of sandstone remaining after the primary blasting, but jackhammers are needed to drill blast holes into the toes remaining and considerable dobey shooting is done.

Until the war years, the sand was hydraulicked into sumps and pumped by steam-driven pulsometers through pipelines to relay stations for repumping and elevation to the wash mill bins. The pulsometers and elevating equipment were inadequate to meet the increased demands and in 1940, two 12-in. Allen-Sherman-Hoff electric-driven rubber-lined Hydroseal pumps were installed for relaying the sand out of the mine up to the wash mill bins in the plant. Then, in 1942, the pulsometers were displaced by hydraulic jets for delivery of the sand, hydraulicked into the sump pits, to electric relay pumps.

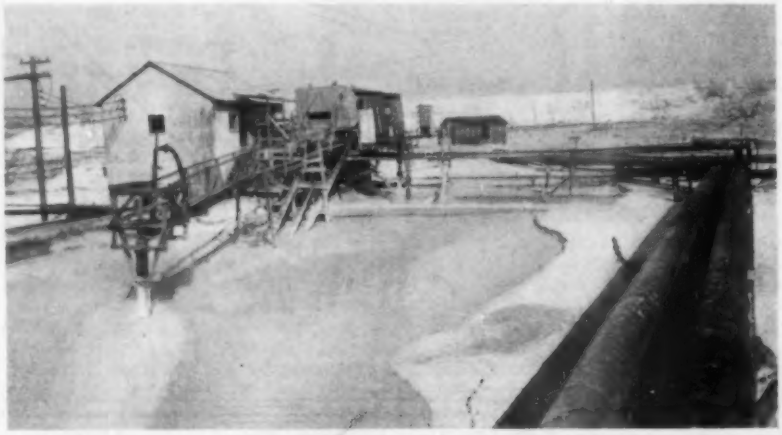
In principle, the hydraulic jet is a water ejector on a large scale. It is not a new development, as such, but its application in the pumping and transport of silica sand in a mining operation of this type is new practice.

As practiced at Ottawa, the silica is hydraulicked into a sump, as it was when steam pulsometers were used, and the suction end of a transport pipe is submerged into the sump. Water under 200 p.s.i. pressure is introduced into the transport line through a conical nozzle, or venturi, near the bend of the pipe just above the sump. The velocity of the high pressure water as it flows through the restricted nozzle opening inside the pipe creates a vacuum which permits static pressure to force the silica into the suction end of the pipe and the silica may be transported for a considerable distance.

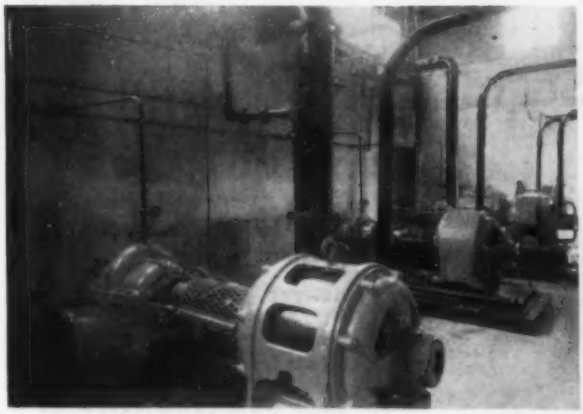
The use of hydraulic jets in this operation is not experimental, in fact 20 of them are installed, any of which may be operated as required. Their manner of use and limitations will be discussed later in this article but we first wish to point out the reasons for their use, since they are one of the most interesting developments in the mine.

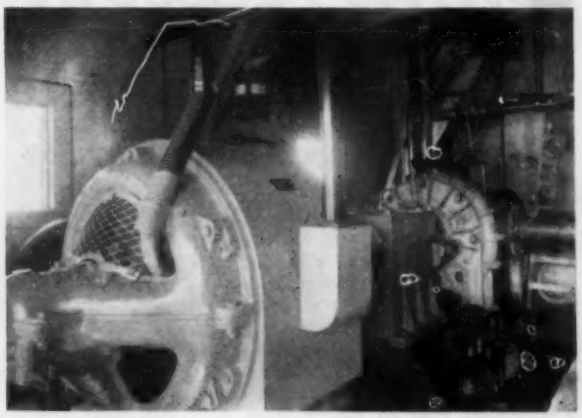
Hydraulic jets are inefficient theoretically but their lack in efficiency is more than compensated for by their advantages over the steam pulsometers. Despite their many disadvantages, the latter machines were kept in service so long because other types of pumps that had been tried in the Ottawa district were unable to withstand the abrasion for any practical length of service.

The pulsometers were extremely heavy to move, they had a high rate of wear and they were inefficient in many respects. Due to their construction, the size of material that could be pumped was limited to ¾-in.



Overflow pond from sump box at pump station. Jet line shown carries fines back to sump box screen to catch more sand





Left: Battery of electrically-driven seepage water pumps. Right: One of the 12-in. (the booster) pumps in main pumping relay station. Pipe on right carries discharge from first pump

top size, which was a handicap to large capacity. Two men had to work under extremely unfavorable conditions shoveling all plus ¾-in. material off the suction plate at each pulsometer. The jets are handling chunks of sandstone up to 4-in. size.

Other disadvantages were that all the steam used was spent, with no means for return of condensate, and steam lines were required to each unit from the steam generating plant. There had to be frequent moving of the equipment and branch lines as mining progressed with the result that the steam lines could not be kept covered to minimize heat losses. The steam consumption was about 125 lb. for one ton of delivered silica and the cost of generation was about 30c per 1000 lb. of steam.

Maintenance of valves was high and on the pulsometer itself, since the sand had to follow a winding route in its passage through. With hydraulic jets, the sand passes through simple pipelines in a nearly tangential flow and most of the abrasive wear is limited to a few constricted points.

A trend in the industrial sand industry is toward the use of greater volumes of water throughout the processing, and at various stages, to increase the purity of product. The large volume of water required in jetting accomplishes much preliminary washing. Steam pulsometers were capable of handling large percentages of solids but required only a small volume of priming water in their operation.

Water Supply

In order to discuss the details of the mining operation clearly, we will first describe how the vast quantities of water, for hydraulicking, mining and washing are handled. First, the mining operation must supply sufficient silica for the requirements of two mills, identified as B and A. Both are located on the edge of the excavation but about ¼-mile distant from each other. All the silica is delivered from the mine, a 100-ft. lift, into the wash mill bins of mill B. After washing, the silica is drained, dried and screened in both mills. Two 8-in. Hydroseal pumps deliver silica from mill B to mill A. Pumping and washing is on an 8-hr. schedule while the drying, grading and loading operations are on a round-the-clock basis.

Source of water for all operations is the seepage accumulation in a pond located in the lowest end of the mined out area. All water finds its way to this pond from various settling ponds in use and seepage water in the subpit is pumped into this pond. An Allis-Chalmers type SH pump and an American Well Works pump, rated at 1500 g.p.m. and 1000 g.p.m., respectively, relay water from the subpit level to the main pond, where a permanent pump house has been constructed.

There are six fresh water pumps at this location; a type MJ2 Allis-Chalmers pressure pump rated at 1250 g.p.m. at 325-ft. head; two Allis-Chalmers 12-in. suction 10-in. discharge SG pumps each rated at 4000 g.p.m. at 130-ft. head; an 8- x 8-in. Allis-Chalmers SH pump rated at 2000 g.p.m. at 130-ft. head; a 6- x 5-in. Allis Chalmers SJ pump rated at 1200 g.p.m. at 120-ft. head; and a Worthington auxiliary steam pump for emergency use rated at 1000 g.p.m. The five electric-driven pumps are direct-connected to 150-hp. Allis-Chalmers motors. Any volume of clear water up to a maximum of 13,550 g.p.m. can be handled by various combinations of pumps, according to fluctuations in the supply water as influenced by rain. These pumps raise the water out of the excavation and discharge into a storage reservoir located between mill B and the power house a half mile away.

Water for washing the silica in mill B is supplied from the clear end of the reservoir at the rate of 6650 g.p.m. by four pumps. They are an Allis-Chalmers SSEB rated at 1800 g.p.m., an Allis-Chalmers SH rated at 2000 g.p.m., an Allis-Chalmers S.E. rated at 2000 g.p.m. and a pressure pump rated at 850 g.p.m.

It will be seen from the sketch that the water reservoir is divided into two connected "lakes." Slimes and water from the wash mill empty into one lake, where the solids settle out and the water flows into the clear water lake adjoining the power house. There is a concrete overflow from the reservoir into a ditch approximately 1¼ miles long which flows into the Illinois River. Clear water from the seepage pond down in the excavation is pumped into the clear water "lake" and clear water for hydraulicking and mining is pumped down into the excavation from this lake.

The power house was completed in 1942, to generate the electrical power for the entire operation and to develop steam for operation of the coil dryers. It houses three Bros steam boilers each of which develops 35,000 lb. of steam per hour at 450 p.s.i. Allis-Chalmers steam turbines (2) drive 1250 k.w. 70 percent p.f. Allis-Chalmers generators.

In the power house are located three 10- x 8-in. Allis-Chalmers SJD pumps which deliver the hydraulicking and mining water for the entire mining operation. They pump against a 450-ft. head to deliver 3000 g.p.m. each to the extremes of the mine where 200 p.s.i. water pressures must be maintained. Each is driven by a direct-connected 500-hp. Allis-Chalmers synchronous electric motor and usually two are in operation with one as a standby.

Water mains are run from the power house through an 8- x 8-ft. tunnel 600 ft. long under railroad yards into the mine. There are two mains, 14-in. diameter and 18-in. diameter, run to the far length of the mine, some 2000 ft., with 10-in. diameter branch lines run to the working faces.

(Continued on page 54)

Sand Recovery

Processing Concrete Sand

By NATHAN C. ROCKWOOD

HAVING MADE a mathematical analysis of the processing necessary to change the grading of a raw sand to meet the mean of the specification limits, as described in the October issue, and installed the required equipment, it doesn't follow that the mean of the specification limits is the most profitable sand to make. It is a logical goal to set, because it allows for the maximum leeway in meeting the specification either way.

However, as in this case, where the processing required wasting a very considerable tonnage of partly processed sand, the producer quite naturally would want to save the most possible and still meet the specification. Were there a good market for discarded material, the producer would probably lean the other way and try to discard as much as possible from his concrete sand and still meet the specification.

In the plant operation described here, the producer did not discard all the minus 16-mesh plus 50-mesh, the "belly" sizes, that we estimated would be necessary to meet the mean of the specification limits. A comparison of Fig. 2 and Fig. 4 in the October issue shows this, as do also the figures in the table.

PERCENTAGE OF SIZES

Original Sand		Mean Sand	Processed Sand	Diff.
Minus 100-mesh	0.5	2.3	2.85	+0.55
Between 50- and 100-mesh	4.7	13.0	13.08	+0.08
Between 30- and 50-mesh	38.4	22.7	33.35	+10.65
Between 16- and 30-mesh	42.1	24.5	19.67	—4.83
Between 8- and 16-mesh	11.2	25.8	16.55	—9.25
Between 4- and 8-mesh	3.1	11.7	12.98	+1.28
Plus 4-mesh	0.0	0.0	1.52	+1.52

Discussion Wanted

● WHILE BASED on an actual plant operation, the results given are not necessarily the actual operating results. This article merely describes one way it can be operated to produce the desired results. Likewise there are many other possible ways to process this sand. Consequently the editors invite discussion, questions and submission of other problems. Both operators and equipment manufacturers are invited to contribute to the discussion.

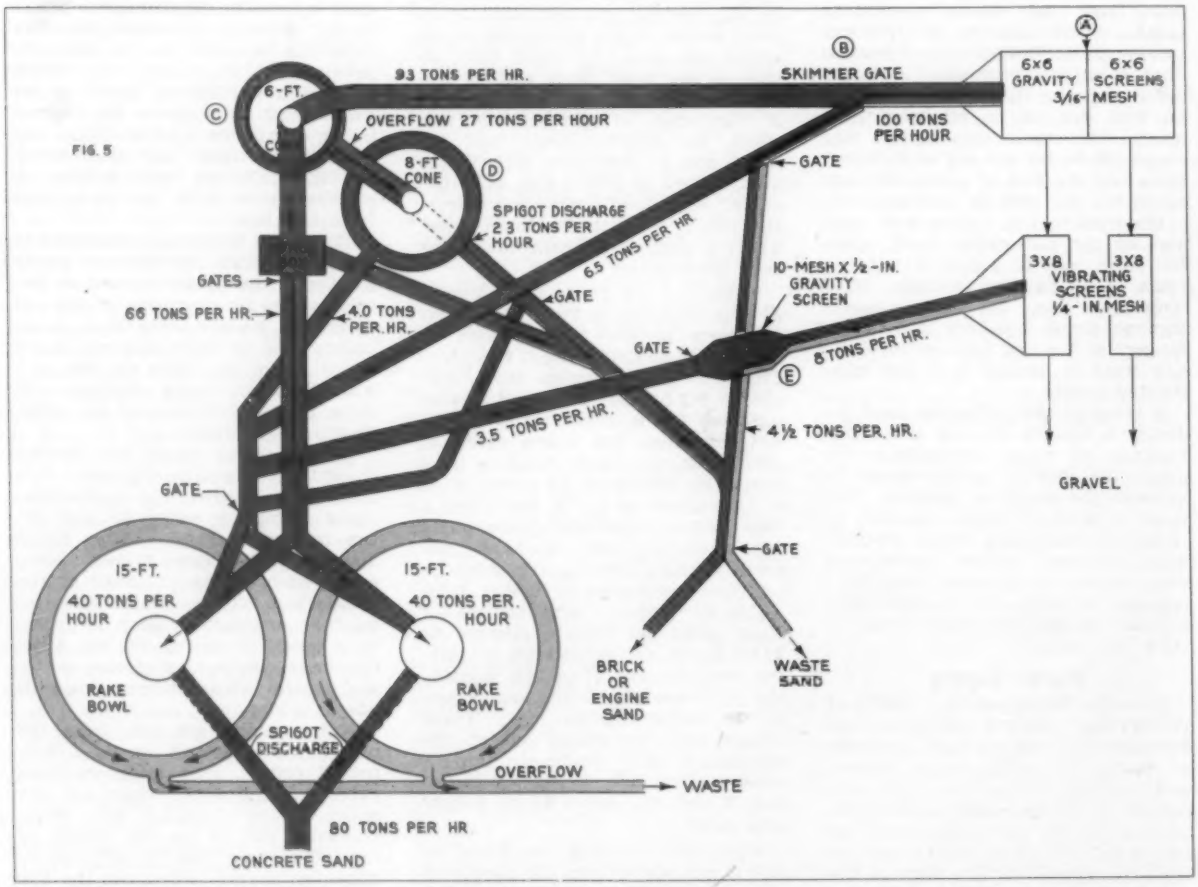


Fig. 5: Flow sheet of sand and gravel plant. Blue indicates flow of recovered materials going into specification, red indicates discarded sizes used for brick and engine sand, and black lines show the flow to waste

This shows that the processed sand has about 10½ percent more of the belly sizes between 30- and 50-mesh than the mean sand, at the expense of sand in 8- to 30-mesh sizes. The curve of the processed sand in Fig. 2 (October issue) shows this graphically.

Therefore, in comparing our mathematical analysis with the processing, we shall have to keep in mind that the processing is set up to save about 10 percent more of undesirable sizes than we estimated on eliminating to meet the mean. Since the hourly output of finished concrete sand was about 80 tons, this meant a saving of 8 tons per hr. or 80 tons per day, which very possibly meant the difference between a profitable and an unprofitable operation.

Operating Data

The feed material in this case was 4500 g.p.m. from a 12-in. dredge pump, which ran 0 to 18 percent solids, averaging 40 percent gravel (over ¼-in.) and 60 percent sand, in which is presumably 1 or 2 percent clay or silt. If we take the average of 0 and 18 we have 9 percent solids and a very large volume of water, proportionately. Probably in this respect our problem is not that of a typical operation, where the raw material is fed with a minimum of wash water. However, the large proportion of water insured more accurate hydraulic classification or sizing. Special means had to be provided to handle such a large volume of water.

Here are the data we have to work with:

Feed material	= 4500 g.p.m.
	= 600 cu. ft. per min.
Solids = 9 percent	= 54 cu. ft. per min.
Water =	= 546 cu. ft. per min.
Weight of solids	= 110 lbs. per cu. ft.
Gravel = 40 percent	= 21.6 cu. ft. per min.
	= 2376 lbs. per min.
	= 71.5 tons per hr.
Sand = 60 percent	= 32.4 cu. ft. per min.
	= 3564 lbs. per min.
	= 108 tons per hr.

It should be noted that throughout this discussion, the percentage of solids is based on volume and not weight. The weight of a cubic foot of solids is taken as 110 lb. This is the figure universally accepted in dredging sand and gravel.

As we are concerned in this discussion only with processing the sand, as illustrated in the flowsheet Fig. 5, assuming raw material at about 108 tons per hour, with say 8 tons being carried over with the gravel, leaving 100 tons as the feed to the sand classification devices.

The first step *A* was to pass all the raw material over two 6- x 6-ft. gravity screens with 3/16-in. square openings on 30-deg. slopes. To do our screening scientifically we should know the velocity of the discharge over the screens, but finding this value is a refinement that few operators practice, preferring to go by experiment, which is probably just as satisfactory. By putting an adjustable baffle in front of the pipe line discharge, ahead of the gravity screens, the velocity of discharge could be readily changed to any desired. Reducing the velocity would increase the amount of material passing the 3/16-in. square meshes, but might also increase blinding.

Fig. 6: One advantage of this operation is its compact arrangement of equipment

One object of the short screens, on rather sharp inclines, with 3/16-in. instead of coarser openings, was to avoid handling an excessive volume of water—546 cu. ft. per min. By rushing the material over these screens, even though some of the coarser sand needed for the finished product was carried on to the gravel screens, the volume of water to be handled was reduced to about 80 percent of the 546 cu. ft. or to 437 cu. ft. per min. Even this was too much for the cone classifiers to handle, so that part of the feed to them had to be diverted.

The next step *B* was to divert part of the feed from the cone classifiers, to avoid flooding them. The launder from the gravity screens carrying the throughs (minus 3/16-mesh) and 437 cu. ft. per min. of water was enclosed, with riser pipes to prevent air locking and to take care of surges. We haven't the necessary figures to estimate all the hydraulic characteristics of this launder. It was 36 in. wide, on a 3-in. to 1-ft. slope, and deep enough to carry the given volume of material, 437 cu. ft. of water plus 30 cu. ft. of sand and silt per min. (100 tons per hr.) which is 7 percent solids.

To split the stream flowing in the enclosed launder, a special gate was inserted, a steel plate, parallel to the surface of the stream, and submerged. An adjustable vane on top of the submerged plate permitted a part of the flow to be diverted to a side launder for addition to the concrete sand, or for brick sand or to waste. Additional flexibility could have been given this splitter or skimmer gate if it were so built as to be adjustable to different depths in the launder.

This skimmer removed that part of the feed material in the top part of the flowing stream—the finer material, because the coarser sands drag along the bottom in the lower part of the stream. By referring to the article in the October issue, it will be found that our original sand is short on fines, so that it is necessary to recover all or part of the fine material skimmed off at *B*.

Third step *C* is to recover the coarsest sand and get rid of some of the excessive amount of minus 16-mesh and plus 50-mesh. Referring to the analysis in the October issue we have 80.5 percent of the original sand in these sizes. Actually, however, what we called raw sand had the screen analysis of a sand processed by a previous plant, from which practically all the fines had been washed out. Therefore our real raw material as fed to the present plant contained about 7 tons out of the 93 tons in minus 50-mesh material. This would reduce the percentage of the belly sizes from 80 to nearer 70, so that instead of eliminating one-half of the belly sand, we have now to eliminate only about one-third, to provide about 53 percent for our finished concrete sand. The classifier *C* was therefore set to make only a rough split on the 30-mesh size.

In this case a rising current type of hydraulic classifier was used.* It is a cone 6 ft. in largest diameter, so designed that the enclosed feed inflow causes a cylinder with vanes to revolve on a central vertical shaft. This reduces or controls the incoming whirling or vortex velocity, partly stilling the horizontal current inside

*Nordberg—Wood, Auto-Vortex, classifier, made by the Nordberg Mfg. Co., Milwaukee, Wis.

the cone, so that the feed material and water drop below and come up between the revolving cylinder and a concentric ring outside of it. The overflow is around the entire circumference to a collecting gutter or launder, which discharges at a convenient place. The space between the revolving cylinder and the ring is the sorting column of the classifier, and of course has a rising current with a horizontal component.

If the reader is familiar with the late Edmund Shaw's booklet on the "Fundamental Principles of Sand Settling" (recently reprinted by ROCK PRODUCTS) he is familiar with the different types of classifiers and knows that in a rising current classifier those sand grains will settle in the sorting column whose falling rate in feet per second is greater than the rising rate or velocity upward of the column of liquid. The falling rate of 16-mesh sand grains will vary somewhat with the material and the density of the pulp (the mixture of sand, silt, mud and water), but according to Shaw's tables is somewheres around 6 in. or ½ ft. per sec. Therefore the velocity of the fluid upward in the sorting column would have to be somewhere near this to settle the plus 16-mesh in the cone and overflow the minus 16-mesh.

The area of this ring-shaped sorting column, as nearly as we can tell from catalog dimensions is between 9 and 10 sq. ft. The overflow ring forming the outside of the sorting column is adjustable as to diameter, so that the area of the column can be changed within limits. The flow that can be put through a 10-sq. ft. area with a velocity of about ½ ft. per sec. is 10 × ½ = 5 cu. ft. per sec., or 300 cu. ft. per min., or 2250 g.p.m. However, in this case we do not want to overflow all the minus 16-mesh. We wish to retain or settle about two-thirds of it. Moreover some 40 cu. ft. of our feed (sand and water) will settle in the cone, so the overflow even with 3000 g.p.m. intake would be only 2700 g.p.m. To keep the feed to 3000 g.p.m., since the launder carries 3500 g.p.m., we must skim off about 500 g.p.m. at *B* gate. It is presumed that this was an afterthought, because of course a cone large enough to have taken the whole flow could have been placed at *C*. However, this skimmer gate does add flexibility, and might well serve in some installations to get rid of excessive amounts of fines, including clay and loam.

Irving Warner (vice-president, Warner Co., Philadelphia, Penn.) has developed an empirical formula for sand settling, which perhaps will prove useful here, if only for checking purposes. It is

$$A = \frac{M^2}{1400} \text{ per 100 g.p.m.}$$

where A = the required area in square feet
M = mesh of the finest material retained

Here M is say 30-mesh

Then $A = \frac{900}{1400} = 0.6$ sq. ft. per 100 g.p.m.

This formula would give $\frac{10}{0.6}$ or $16.7 \times 100 = 1670$ g.p.m., which is about half the previous figure, and is probably based on the rate of settling in a box or other device with a surface current and still water below. In any event we do not desire to float off more than about one-third of our limiting size. Much will depend in an operation like this on the results of experiment and experience.

We shall assume then that the 6-ft. cone *C* is operated to handle approximately 3000 g.p.m. and to separate or settle all the plus 16-mesh and approximately two-thirds of the minus 16-mesh plus 50-mesh, and to overflow all the minus 50-mesh.

We shall assume also that in skimming the feed to the *C* cone at *B* to 3000 g.p.m., or 400 cu. ft. per min., 28 cu. ft. will be solids and 372 cu. ft., water. Thus, of the 28 cu. ft. of solids about 20 cu. ft. (66 tons per hour) must be recovered here for our basic sand. Assuming that the 20 cu. ft. of sand removed in the *C* cone carried with it an equal amount of water, we have a feed of 360 cu. ft. per min. left for the overflow, of which 8 cu. ft. are solids.

This 6-ft. cone discharges automatically through an inverted cone-shaped valve or spigot. The spigot discharge is adjustable, which of course makes it possible to control, within limits, the size of sand settled, or vice-versa, the volume of the overflow and the size of material it carries.

Since this spigot sand from cone *C* is the basic or control sand, it is necessary to have an accurate control of both the quantity and consistency. This is accomplished by placing a ½-cu. yd. surge box directly under the spigot. This box overflows to a launder below, which carries the surplus to waste, or to the brick sand. Adjustable gates in this surge box divide the flow evenly to the two rake-bowl thickeners, as will be described later; and also, of course control the overflow point of the surge box.

Adding Fine Sand

The next step is *D* operation in which the overflow from the 6-ft. cone classifier, containing approximately one-third of the minus 16-mesh plus 50-mesh, and practically all the minus 50-mesh, is fed to a second cone classifier of the same type as the first. This classifier is 8-ft. in diameter with a sorting column having an approximate area of 15 sq. ft. The object is to make the split at minus 50-mesh. Assuming we have removed from the 3000 g.p.m. (400 cu. ft. per min.) fed to the first cone all the plus 16-mesh and about two-thirds of minus 16-mesh plus 50-mesh, as the basis of our concrete sand, we want now to get rid of all the remaining minus 16-mesh plus 50-mesh in this second classifier.

According to Shaw's tables, already referred to, the settling rate of 50-mesh sand is about 2 in. or 0.17 ft. per sec. The area of our sorting column is approximately 15 sq. ft. and the feed 360 cu. ft. per min. or 6 cu. ft. per sec., which gives 0.4 ft. per sec. velocity, while the theoretical velocity required according to our assumed figures is nearer 0.2 ft. per sec. The difference could be accounted for in various ways, for example, we are dealing here with a very dilute suspension; the settling rates of sand grains of different shapes vary by as much as 100 percent, and we have made arbitrary assumptions as to the amount of sand and water removed in the *C* cone, and also, probably, only approximated the area of the sorting column—all for the purpose merely of illustrating the kind of calculations involved.

As operated, the *D* cone made an accurate split at the 50-mesh size. This sand separated out in the *D* cone is the "belly" sand (Fig. 2), which it was necessary to remove; it goes as the spigot discharge to the brick sand stockpile, or, as the flowsheet shows, some part of it may be returned to the concrete sand, if required. It is the overflow from the *D* cone that is desired for the concrete sand—the minus 50-mesh.

Our feed to *D* cone is 360 cu. ft. per min., of which about 8 cu. ft. are solids. Of this feed something less than 7 cu. ft. per min., or about 23 tons per hour is discarded settled or spigot "belly" sand; and something over 1 cu. ft. per min., or 4.0 tons per hr., is in the overflow that goes to a launder which divides it equally to feed the two rake-bowl thickeners.

We still have the fine sand and silt which was split or skimmed from the launder at *B*. This was assumed to be about 500 g.p.m., with about 2 cu. ft. of solids per min., or 6.5 tons per hour. This also joins the fine sand in the overflow launder from *D* cone.

Recovering Coarse Sand

We have now to recover (operation *E*) and add the coarse sand lost in

Fig. 7: The 6-ft. and 8-ft. cone classifiers and riser pipes to prevent air

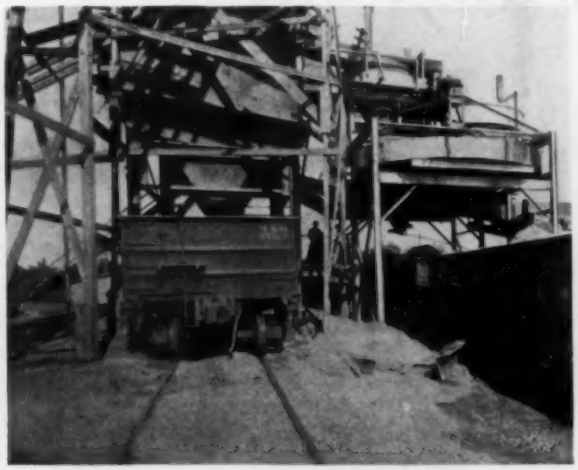


Fig. 8: The 15-ft. rake bowl thickeners discharge direct to cars

the first gravity screens. This went over with the gravel to two vibrating screens, the gravel sizing screens. These are 3- x 8-ft. triple-deck with ¼-in. mesh on the lowest deck. Additional wash water is applied to wash the gravel and aid the separation of the sand.

By reference to the article in the October issue, it will be recalled all we wanted to add to the concrete sand were the plus 8-mesh and plus 16-mesh sizes. So the sand that passed the ¼-in. mesh screen on the lowest decks of the gravel screens was passed over a 24-in. by 6-ft. gravity screen in the launder, which has a slope of 2 in. per 1 ft. and leads to the launder from the *D* cone. This plate screen has 10-mesh or 8-mesh by ½-in. slot perforations, so that the material which passes over is all plus 8-mesh. A gate in this launder controls the amount of this sand added to the concrete sand, which, according to our estimates, is about 3.5 tons per hour to raise the total to 15 percent in our finished product. (Some coarse sand was, of course, recovered in *C* cone.)

Final Processing

We now have a launder carrying approximately 66 tons per hour of basic sand (the spigot discharge of *C* cone, 4 tons of fine sand and silt recovered in the overflow from *D* cone, 6.6 tons of sand and silt from *B* gate, and 3.5 tons per hour of coarse sand from the 8-mesh by ½-in. launder screen). This adds up to about 80 tons per hour, all now flowing in the enclosed launders to the rake-bowl thickeners.

The final processing is done in two 15-ft. diameter rake-bowl type of classifiers†—that is a shallow bowl with a cone bottom and with motor-driven rakes on arms revolving on a vertical shaft in the shallow part of the bowl to scrape the settled sand into the cone, which has an automatic discharge spigot. These rake-bowls are called classifiers and can be so used, but in this installation they are used primarily as mixing, cleaning and dewatering devices. They do no classifying, except to separate the sand from the mud and silt which have been carried along throughout the processing. They could be more properly described in this operation as thickeners, and their design is very similar to that of a standard thickener, ordinarily used for finer materials.

†Made by the Nordberg Manufacturing Co., Milwaukee, Wis.

These rake-bowls apparently get nearly all the 437 cu. ft. per min. of water in the first (*A*) launder less 8 cu. ft. removed in *D* cone, and settle about 80 tons per hr., or 24.2 cu. ft. per min., of sand. That means each bowl handles 227 cu. ft. per min. of feed, and must settle or retain all the plus 100-mesh and a small percentage (about 3) of the minus 100-mesh. Since the output is about 800 tons per 10-hour day, we assume about 1.5 percent of the solids that reach the bowls are overflowed as waste (silt, loam, etc.). Since the settling rate or velocity of 100-mesh sand is between 0.02 and 0.05 ft. per sec. and the overflow of each cone is about 200 cu. ft. per min. or 3.6 cu. ft. per sec., the sorting column of the rake-bowl thickener must have an area somewhere around 100 sq. ft. or more. Apparently it has about 120 sq. ft., the overflow being to a gutter around the entire circumference, which reduces the overflow velocity to practically nil.

Recapitulation

The finished sand according to screen analysis (Fig. 2) gives the following:

Sizes	Percentage	Tons per hour
Minus 100-mesh	2.85	2.4
100- to 50-mesh	13.08	10.5
50- to 30-mesh	33.35	26.6
30- to 16-mesh	19.67	15.8
16- to 8-mesh	16.55	13.2
8- to 4-mesh	12.98	10.3
Plus 4-mesh	1.52	1.2
	100.00	80.0 tons

The recovery described was as follows:

2.4 tons of minus 100-mesh from *B* and *D* operations, with final recovery in bowl thickener.

10.5 tons of 100- to 50-mesh from *B*, *C* and *D* operations (most of it from *B* and *D*; there was about 2 percent of required minus 50-mesh in *C* spigot.

26.6 tons of 50- to 30-mesh from *B* and *C* operations; nearly all probably from *C* spigot.

15.8 tons of 30- to 16-mesh } nearly
13.2 tons of 16- to 8-mesh } all from *C* with a small amount from *B* and *D*.

10.3 tons of 8- to 4-mesh, about 8.0 tons from *C* and 2.3 tons from *E* operation.

1.2 tons of plus 4-mesh, all from *E* operation.

The basic or control sand from *C* cone spigot apparently had about the following sieve analysis:

Minus 100-mesh	0.1 tons (trace)
100- to 50-mesh	2.0 tons
50- to 30-mesh	26.6 tons
30- to 16-mesh	15.8 tons
16- to 8-mesh	13.2 tons
8- to 4-mesh	8.3 tons
	66.0 tons

Tennessee Phosphate Production Problems

First of a series of articles dealing with exploration, testing and evaluation of brown phosphate deposits. Other articles will describe mining, transportation, washing and beneficiation operations

By OTTO H. WUSTRACK

PHOSPHATE was discovered in middle Tennessee in 1893 and mining, such as it was, started within a year. Brown rock is an amorphous impure tricalcium phosphate intimately associated with fluorine and is generally believed to be derived from beds of phosphatic limestone of the Ordovician and Devonian geological periods. In color it ranges from purple to light gray, but predominates in the darker shades of brown, which color is also the streak of the mineral and is used as identification in the field to distinguish it from certain brown siliceous rocks sometimes found intermixed with phosphate plate rock. Other characteristics are the abrasive feel experienced when rubbing muck between the fingers, the peculiar structure of the plate rock resembling the roe of fish cemented together and the hook-like shape of the individual sand granules.

Up into the early 1920's the grade often ranged up to 80 percent tricalcium phosphate or, as the fertilizer trade calls it, bone phosphate of lime (B.P.L.). Those grades however belong to the past, for today, even with the best washing, flotation, and other concentration methods available, operators are glad to see 72 percent in their storage bins. At least two-thirds of the tonnage produced today is in the form of sands derived from the clayey matrix or muck which seldom washes up better than 70 percent B.P.L.

Before going further it will be best to define some terms which will be used frequently in these writings, and which otherwise might cause confusion to the reader.

Muck is the unwashed clayey matrix containing phosphatic sands. Sometimes instead of being clayey the matrix is associated with small sea shells and is called *Hermitage Shell*.

Rock is the general name covering mixed plate rock and sands.

Lump is plate rock which ranges from ¼-in. up to 6- or 8-in. size and sometimes larger.

Raw Rock is the lump and sands after being washed, dried, and ground, but not processed chemically. (Such products as superphosphate, treble super and meta phosphate are chemically processed from raw rock and will be defined and discussed in a later article.)

Close-up of hydroseparator which recovers extreme fines, Hoover & Mason Phosphate Co.

Otto H. Wustrack

THE AUTHOR

• The author of this series of articles, beginning in this issue, graduated from the University of Wisconsin in 1934 with a B.S. degree in chemical engineering. His articles will have practical value for they are based on seven years' experience as works engineer of the Hoover & Mason Phosphate Co. at Mt. Pleasant, Tenn. Mr. Wustrack is now design, engineer for the Pfaudler Co., Rochester, N. Y.

Cutters are isolated pockets of phosphate found in limestone fissures and between limestone saddles.

Saddles or *Horses* are ridges of limestone rising as much as 30 ft. above the flat bedrock, and are peculiar to several scattered areas.

The early mining was of the crudest, the methods employed being of the pick and shovel and mule team varieties. Large masses of plate rock lay near the surface and were broken up and hauled to open air wood burning kilns, upon which, after "burning," the high grade lumps or plates were ready for market. Only the densest lump was taken which was also the highest grade, leaving the softer, lower grade lump and all of the sands for the advent of washing plants and draglines.

There are also deposits of white and blue rock in the middle Tennessee field, which is southwest of Nashville in the vicinity of Mt. Pleasant, but as yet they are not being developed on a large tonnage basis. Insofar as the latter is concerned, tunnelling is required, which is hard put to compete economically with the open pit strip mining used on the brown rock.

In the early days the richness and extent of the phosphate in many localities was so obvious that pur-

chases of mineral rights were often made on what today would be considered meager prospecting data. It was usual for a local independent chemist to make the analyses which became the basis of settlement. Contracts were only consummated on rock which ran 75 percent B.P.L. or better, lower grades being considered unmarketable. Thus huge tonnages of rock were not even estimated in these deals, but with the depletion of the highest grades, specifications had to be lowered and remining of previously worked areas became profitable. One tract in which the writer has had occasion to be interested, has been remined five times in the last twenty years.

Today, the expansion of markets, lower margins of profit, and uncertainty of the quantity and quality of the remaining deposits, make prospecting a careful and methodical undertaking, integrated with other plant operations. Every one of the major producers operates its own analytical laboratory both for prospecting and control, and maintains a prospecting crew.

Grades down to 20 percent P_2O_5 (43.7 percent B.P.L.) are contracted for, providing there is sufficient lump or muck of higher grade to bring a premium, and thus bring the handling costs of the lower grades within reason. The low grades, especially with the high lime and silica ratios, are particularly suitable for charging in the electric furnace in the manufacture of elemental phosphorus. This market was nonexistent a decade or so ago. The higher grades are still used for direct application to the soil in the finely ground state, for livestock feed supplement and for the manufacture of superphosphate, treble super and meta phosphate. Grades of 75 percent B.P.L. bring premium prices not only because of the phosphate concentration but because of the desirability of low alumina and iron in the manufacture of superphosphate. In keeping with these market conditions, prospecting data must yield the answers to the following questions:

1. What is the total tonnage of marketable phosphate?
2. What percentage is fertilizer grade?
3. What percentage is furnace grade?

Prospecting must also yield information which has a direct bearing on costs of mining and transportation, namely:

4. Tonnage concentration per acres of tract.
5. Overburden to muck ratio.
6. Maximum depth of overburden.
7. Percent recovery after washing.

In general it is impractical to handle more than 40 ft. of overburden, or to mine less than a 1-ft. layer of matrix. This is due to the mechanical limits of the machines used.

Dragline excavating phosphate "muck" at deposit of Charleston Mining Co.

Two other factors which bear on the evaluation given to a mineral property but which are not directly related to prospecting are:

8. Distance from washing plant.
9. Kind of transportation necessary.

These factors will be discussed under a later article devoted to mining and transportation.

Estimating Tonnage

The question of tonnage can only be easily answered when a blanket deposit is encountered which is rather unlikely today; in fact cutters and saddles, hatbrim deposits and mined-over areas seem vastly preponderant. To minimize errors in tonnage estimation, as well as to aid in correlating points in the tract with corresponding points on the prospect map, the area to be prospected is laid out by instrument, into 100-ft. to 200-ft. squares. The corners are the locations for initial auger borings and, pending the findings in these first probes, other borings are made or not, as warranted. The holes are about six inches in diameter and are made with a tool called a prospect auger, which is quite similar to a common post-hole auger in its operation. This method of exploring the strata is simple, fast, and therefore cheap, and is fully adequate for preliminary work such as defining the general outline of the deposit and aiding in establishing depth of overburden and rock. It has, however, some inherent disadvantages, viz., the difficulty of (a) visualizing the true character of the phosphate strata, (b) estimating tonnage on the evidence of the small sectional area explored, (c) preventing contamination of phosphate with earth or one phosphate layer with another. The last named becomes quite a handicap on deep holes with dry soft overburden.

To illustrate what could happen to make tonnage estimates in error, let us assume we are in an area of limestone saddles. The contour of the earth's surface does not of course indicate the presence of irregularity. Auger holes are put down to 100-ft. spacings, and it so happens that the nodes of these formations are also on approximately 100-ft. centers with the cutters falling in between. They show, as a group, a uniformly thick, high grade layer of rock and muck. The tonnage estimate on that basis will not only be too large, but the estimated cost of mining will be too small, neither fact of which will come to light until actual mining is well under way.

The seriousness of contaminating the samples can be illustrated by the following example: A certain deposit shows up in the auger samples to be of one grade, namely 64 percent B.P.L. Upon digging pits to supplement the auger hole data it is found that the total rock depth can be divided into two separate layers, each of which can be brought out separately to the washing plant. The estimate shows 10,000 tons of 60 percent B.P.L. which is furnace grade, and 5000 tons of 72 percent B.P.L. which is fertilizer grade. Not only is the base price of the latter much greater than can be accounted for by the difference in grade between it and furnace grade, but the makers of elemental phosphorus who use the furnace grade very often buy on contracts which pay only a very small additional premium on 64 percent material. On the other hand contracts made for high grade rock carry not only the higher base price as mentioned above, but have premium-penalty clauses which make it profitable for the seller to keep the

(Continued on page 55)

Mining Silica Hydraulically

(Continued from page 47)

At present, the mine has three principal working faces. One is called the east rock face, another is the south rock face and the third is a subpit operation below the main floor level. The south rock face is mined during the summer months and the east rock face in the winter months, to take advantage of the sun's heat during freezing weather. Thus, operations at one of the main faces with two monitors and two jets in operation and in the subpit, with a single monitor and jet, proceed simultaneously.

The main excavation now is proceeding at a location approximately 2000 ft. distant from mill B and relay pumping stations have been set up. A main relay station is permanently located to deliver silica through 1200 ft. of 12-in. pipeline and then a 100-ft. vertical lift into mill B. There are two relay points from the main mining face, and also from the subpit, which deliver silica to the main relay station.

Mining water for operation of the monitors is about 40 percent of the total delivered in the water mains and is tapped from the 14-in. main into branch lines to each mining face. The balance goes for the operation of the jets.

A consideration in the design of the power house was provision for furnishing heated water from the steam condensers for mining operations during freezing temperatures. There are two condenser pumps with a rated capacity of 1600 g.p.m. each in the power house and the condenser water discharges into the fresh water intake tunnel for the fresh water mine supply pumps. It is possible to deliver mining water for hydraulicking during the coldest winter temperatures at a minimum temperature of 56 deg. F. at the monitor nozzles, which is sufficient to remove the frost from frozen chunks of sandstone. The 14-in water main is covered with jute to minimize heat losses. By being able to furnish heated water the mining operations can continue throughout the year. Any surplus heated water from the condensers can be directed into the 18-in. line for jet operation.

Great flexibility is needed at each mining face since it is not desirable to make frequent moves of the relay pumping stations and this is accomplished by the use of a number of jets at each mining face. There are 20 jet installations in all, but only two at the main rock face and one at the subpit level are operated simultaneously. There are three monitors in operation at any one time as well. The monitors have Universal Nozzle Co. type H heavy-duty turret nozzles with 4-in. diameter inlets and 1⅜-in. diameter discharges. There is an approximate 25 p.s.i water pressure drop through the nozzle to 175 p.s.i

At the main face, either the south or east face, there are seven jets set up on approximately 100-ft. centers with their transport lines converging to a relay pumping station. Thus, there is a working face of 700 ft. to 800 ft. opened up which enables drilling operations and blasting to continue while two monitors and their jets can function without interruption. There are two men to a crew at each monitor, two repairmen and two dynamiters. Other personnel in the mine include two blast hole machine operators and two relay pump men.

The jet intake pipe, at each location, is submerged in a wooden sump box covered with 4-in. opening grate bars. Hydraulicked sand flows by gravity into the sump box and the jet transports the sand and water through a 10-in. pipeline to the relay station. Each jet pipeline carries 35 to 40 percent solids by volume.

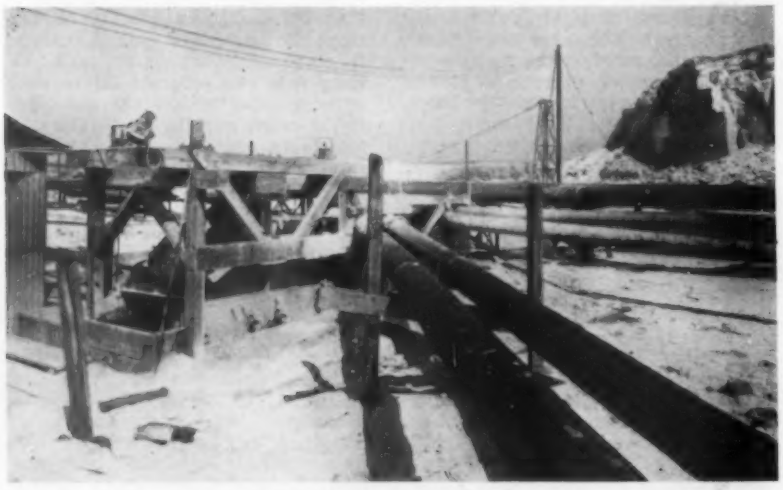
The jet lines converge into a discharge box from which the silica flows over a 4- x 8-ft. Allis-Chalmers single-deck, low head vibrating screen with ¼-in. square screen openings. Trash and large chunks of sandstone which usually contain any pyrites, flow over the end of the screen into a pit and the silica plus water enters a 20- x 20-ft. sump box 16 ft. deep from which the relay pump gets its feed.

Jets are not practical for any considerable lift through pipelines so the discharge box in each case is built with very little elevation and the sump box is flush with the mine floor. According to the mine foreman, an 8-ft. head is the maximum which, for operational purposes, can be overcome in this operation by a jet, so each unit is set up so that it mainly must overcome the frictional head loss in the line. Free flowing material from the face to each jet is so much that high concentrations are unavoidable. The limit of operation is when the frictional losses slow the velocity in the line so the sand will not remain in suspension, which is approximately 600 ft. When the lines reach this limit, it will then become necessary to relocate the relay pump station.

At the relay station, the excess water, carrying clay and slimes, overflows into a settling pond and the sand which settles in the sump box is pumped to a similar arrangement of a discharge box, screen and sump box at the main relay pumping station by a 12-in. Allis Sherman-Hoff D-frame rubber-lined Hydroseal pump driven through Texrope drive by a 250-hp. Allis-Chalmers squirrel cage motor. This pump delivers up to 60 percent solids by volume to the main relay pumping station.

At the main relay pumping station the general arrangement is similar, but there is a larger vibrating screen, 4- x 10-ft., since this station also receives the flow from the subpit operation where a 375-ft. face is being mined. The practical operating limit of these pumps under the frictional and static heads encountered is through approximately 1000 ft. of pipeline at the recommended pump speed of 720 r.p.m. At the main station, there must be overcome the frictional loss, with 60 percent solids, through 900 ft. of pipeline plus a 100-ft. static head, so two 12-in. Hydroseal pumps are connected to operate as a 2-stage pump. One is a booster.

The first pump is driven by a direct-connected 250-hp. Allis Chalmers synchronous motor; the second (booster) by a direct-connected 250-hp. Allis-Chalmers slip-ring motor. The peripheral speed of the rubber impellers being the controlling factor



Close-up of first relay station. Note vibrating screen and low sump box. Pump is installed in house to the left

in these relatively slow speed pumps, the pumps are operated at approximately 720 r.p.m. each and have delivered as much as 900 tons of solids per hour to the wash mill bins. Of course, the intake of the booster pump must be under pressure from the discharge of the other pump.

One important factor in an operation of this kind is that the output of the relay pumps be such as to closely approximate the volume of material the main relay pumps can handle, otherwise excess fine sand will overflow the sump box from which the main pumps derive their feed. At present, a single monitor and jet are supplying the feed for an 8-in. Hydroseal CD frame relay pump in the subpit which delivers to the main relay pumping station and the sand from the single 12-in Hydroseal relay pump at the main face is also being delivered to the main relay pumping station.

The latter pump is driven through Texrope so that the volume of material it delivers to the main pumping station may be varied. The speed of this pump, and therefore the volume it will handle, is varied according to the frictional head to be overcome, by varying the sheave drive ratios. At present the pump is driven at approximately 500 r.p.m. When the jets feeding it are moved to their practical limiting delivery distance it will be necessary to move the relay station further from the main relay station and the drive ration of the pump will be changed to increase its speed. At a distance of 1000 ft. the pump will be driven at 720 r.p.m. which is its top recommended speed.

At each relay pumping station there is a sump box which, in each case, overflows excess water, fines and clay into a settling pond where more of the sand is settled. When these ponds fill up, their contents are pumped back over the screen by a separate jet, in order to recover more of the sand. Similarly, the plus ¼-in. rejects are ejected from their pits by a jet when necessary and are transported through pipeline to where they may be disposed of.

The water overflowing these several ponds is clarified and is reclaimed. An elaborate system of dams, tunnels and runbacks has been developed so that all this clear water will find its way back to the main seepage pond, to be pumped into the main water reservoir for re-use.

The company has standardized on spiral-welded pipe for all its pumping operations—sand and clear water. Weight is an important factor, since there is much handling involved in the operation. The standard length is a 20-ft. section which, in the case of the 18-in. diameter pipe, weighs 600 lb. A Caterpillar tractor does

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Tennessee Phosphate

(Continued from page 53)

grade above 70 percent. Conversely, the penalties involved when the grade falls below 68 percent are often disastrous to fair profit margins. The following table shows the difference in values.

	Auger Data Alone	Complete Prospection
Tons—washed, dried	15,000	10,000
Grade 1—B.P.L.	64.00%	60.00%
Oxides of Fe. & Al.	6.00%	7.00%
Insol. SiO_2	8.35%	10.00%
Selling Price @ $3.70/ton or $55,500		@ $3.30/ton or $33,000
Tons—washed, dried		5,000
Grade—B.P.L.		72.00%
Oxides of Fe. & Al.		4.00%
Insol. SiO_2		5.00%
Selling Price		@ $5.00/ton or $25,000
		Grand Total.....$58,000

Difference: $58,000 — $55,500 = $2,500.

Thus the evidence of the auger data alone might well be just cause for rejection of the tract as unprofitable.

Test Pits

The next step in exploration is the digging of pits which are also located at 100-ft. intervals, but only where previous auger data warrant. These are dug entirely with pick and shovel and are rectangular in shape, large enough to allow a man room to work down with his tools. The pit takes many times as long to dig as the auger hole, but it offers close visual inspection of the various phosphate strata, accurate sampling, and re-examination as frequently as desired. Ease of measurement of overburden and phosphate layer serves as a check on the same obtained from auger holes. But pits too have some of the shortcomings of auger holes in that only a small cross-section of the tract is sampled.

In a tricky deposit on a large acreage a final examination is sometimes made with a small mobile, Diesel - powered, tractor - motivated dragline with a ½-cu. yd. or ¾-cu. yd. bucket, which quickly digs a narrow trench the length of the tract.

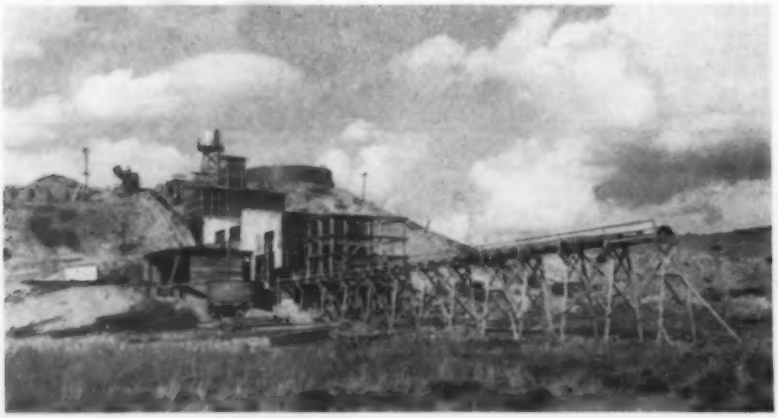
Laboratory Analysis

Be they from auger hole, pit or trench, all the separate samples from the various sources are taken to the laboratory for physical examination, determination of moisture content, percent recovery, grade in B.P.L. or P_2O_5, percent iron as Fe_2O_3, clay as Al_2O_3, and insoluble SiO_2. Other determinations are seldom made except by makers of elemental phosphorus and stock feed supplement. This data added to measurements taken in the field, all transferred to the proper designations on the prospect map, complete the information by means of which the first seven questions can be answered. A study of the map for relief, nearby roads, size of tract and its isolation or proximity to other property linked to the plant, will answer questions eight and nine. Not until all of these questions have been given careful consideration can an evaluation be placed on the rock in the ground, as well as the probable cost of mining, hauling and washing ascertained. However, it is to be recalled that the prospect samples are all washed by hand and therefore good judgment is required in interpreting those results into plant performance if preliminary cost figures are to mean anything.

Washed Samples

To show what the difference between the two is, a brief illustration follows: In hand-washing a weighed portion, usually 10 lb. is placed into a 12-qt. galvanized bucket with clear water added to near-fullness, whereupon the muck is kneaded and rubbed carefully by hand to loosen the clay from the sand, the two being separated by decantation, the clay overflowing as a suspension. After each decantation fresh water is again added and the finger work repeated, until the cycle has been repeated three times. The last water has very little clay to carry away, the sands having become quite clean. In washer plant operation on the other hand, water velocities are great enough to carry measurable quantities of phosphate sands into the tailings pipe, thus reducing the percent recovery over that obtained by hand washing. Then too, with water supply limited as it usually is, the sands are not washed as clean, hence making for a lower grade than that obtained by hand washing. Many other factors affect grade in the washing plant but these will be properly discussed in articles pertaining to washing. The problem of grade is however sometimes complicated by the fact that certain types of muck go down in grade with washing. In the writer's experience this has happened to low grade samples high in silica containing unusually fine phosphate sands, which are lost along with the clay leaving the heavy silica to be retained in the washed sample.

A less complete analysis could easily lead to the false conclusion that any two deposits containing the same grade of rock, the same tonnage per acre and equi-distant from the plant, would carry the same evaluation.



General view of Gila fluorspar plant with mill building and thickener in background and long conveyor on trestle for disposal of waste

By NATHAN C. ROCKWOOD

International Minerals and Chemical Corporation is operating fluorspar recovery plant for Metals Reserve Co., a federal government corporation

Sink and Float Process Applied to Fluorspar

UNLIKE FROTH FLOTATION, the sink and float process of mineral concentration requires no more special knowledge than that required to understand simple hydraulic classification as commonly practiced every day by sand and gravel producers in the separation of different sizes of commercial sand. The only difference is that instead of using plain water for the medium to sink the larger grains and float the smaller ones, a medium of greater apparent specific gravity—a heavy medium—is used in place of plain water.

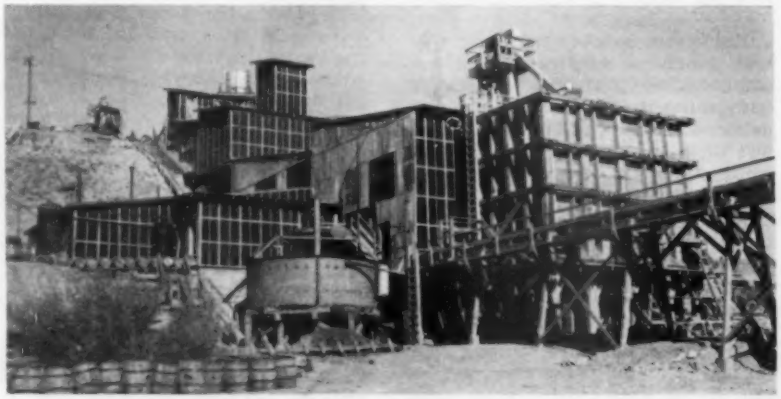
This heavy medium may be a suspension of some finely ground heavy mineral like ferro-silicon, galena, magnetite, etc., in water. To keep these heavy mineral particles suspended in the water, the mixture has to be kept agitated. This requires special equipment, but of types familiar to nearly all rock products operators. Then, of course, since the mineral used to give the medium its greater specific gravity, or weight per cubic foot, is valuable, it has to be recovered and used over and over again. The general applicability of the process depends on the amount of small irrecoverable loss of the medium. If the cost per ton of mineral concentrated in terms of lost media is low enough, any mineral may be so concentrated.

Thus far the sink and float or heavy media separation process has been applied to lead-zinc, lead, iron, tin, tungsten, fluorspar and garnet ores. Coal has long been separated from slate by this process (known as the Chance process). If mineral aggregate specifications ever become stiff enough, this process may have to be applied to separate good, solid aggregate particles from shale, slate, certain cherts, and deleterious minerals generally. The heavy media separation process also may have other applications in the industrial minerals industries.

Applied to Fluorspar

The nearest approach to the rock products industries of the heavy media process that we know of is its application to the concentration of fluorspar. There are now two such operations, one belonging to the Metals Reserve Co. (U. S. Government) at Gila, N. Mex., operated by the International Minerals & Chemical Corporation, Chicago, Ill. A brief description of the sink and float processing here should be of general interest to all rock products operators, some of whom may see more possible applications than we do.

The process depends on the fact that particles of high specific gravity settle faster than particles of less specific gravity, so if the medium has a specific gravity equal to or greater than the specific gravity of the particle, it doesn't sink at all, but floats. As in any commercial type of settling device, since liquid is constantly being added and is overflowing, there is an upward current to aid in the floating. One advantage of the process is that the mineral does not need to be ground or pulverized any finer than is necessary to make a partial separation of the minerals into their separate crystals or grains. Thus, as in gravel or crushed stone, where separate pieces of silica or limestone are mixed with separate pieces of



Mill buildings with 16-ft. thickener in the foreground

shale or chert, comparatively large pieces could be floated off.

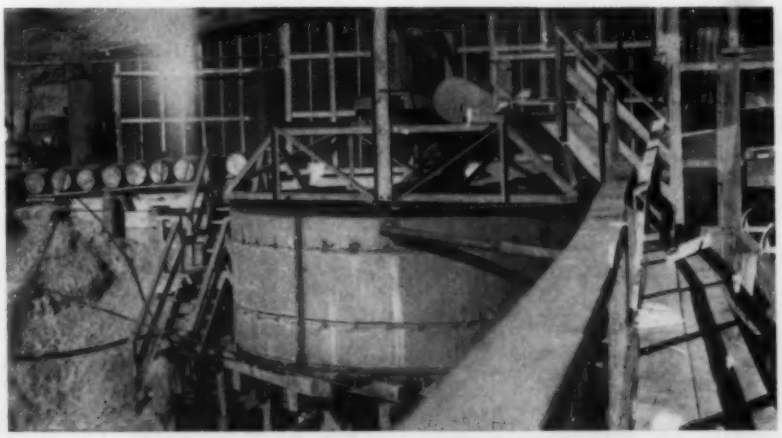
In this fluorspar operation the ore or spar, which is a mixture of fluoride, calcium carbonate, and silica, is crushed to plus ⅛-in. minus ¾-in. size. Cleaning and sizing is done in a Telsmith rotary scrubber-screen, with an inner shell having ¾-in. perforations and an outer shell with ⅛-in. slots. The fines are concentrated by jigging, and will not be considered here, as we are interested only in the application of the heavy media process.

To give the necessary density or so-called specific gravity to the liquid in the cone classifier, a ferro-silicon (83 percent iron, 15 percent silica, 2 percent carbon) pulverized to minus 100-mesh is used as the heavy medium. Enough is kept in suspension in the water to give the liquid a density of 2.73, controlled within a range of 0.025. The specific gravity of the fluorspar is 3.2 and the specific gravity of the gangue, or accompanying minerals, ranges from 2.65 to 2.70. Since the concentrate still contains about 25 percent gangue, or impurities, the specific gravity of the fluorspar grains sunk or recovered in the cone is 3.1 to 3.15.

Equipment Required

The separating is done in a 10-ft. diameter cone, similar in most respects to any ordinary sand cone, except that it has special facilities for agitating the liquid and for removing the concentrate (the "sink") product. The liquid is agitated and the ferro-silicon kept in suspension uniformly throughout the cone by slowly moving (6 r.p.m.) arms and by release of compressed air from two small jets near the bottom which also give the fluid a circular motion. The center shaft is hollow and its opening about 6 in. above the bottom tip of the cone serves as the intake of an air-lift pump to remove the settled concentrate. A Sullivan EE air-cooled compressor of 120 c.f.m. at 40 lbs. pressure furnishes all the air required.

The next step is to recover the ferro-silicon which goes out with both the sinks and the floats. Both go over an Allis-Chalmers 3- x 10-ft. low-head vibrating screen, divided longitudinally in the middle, which is a drainage screen with 0.069 in. by ⅜-in. opening screen cloth. The heavy media, the ferro-silicon and water, drained out here goes back directly to the cone media feeder.

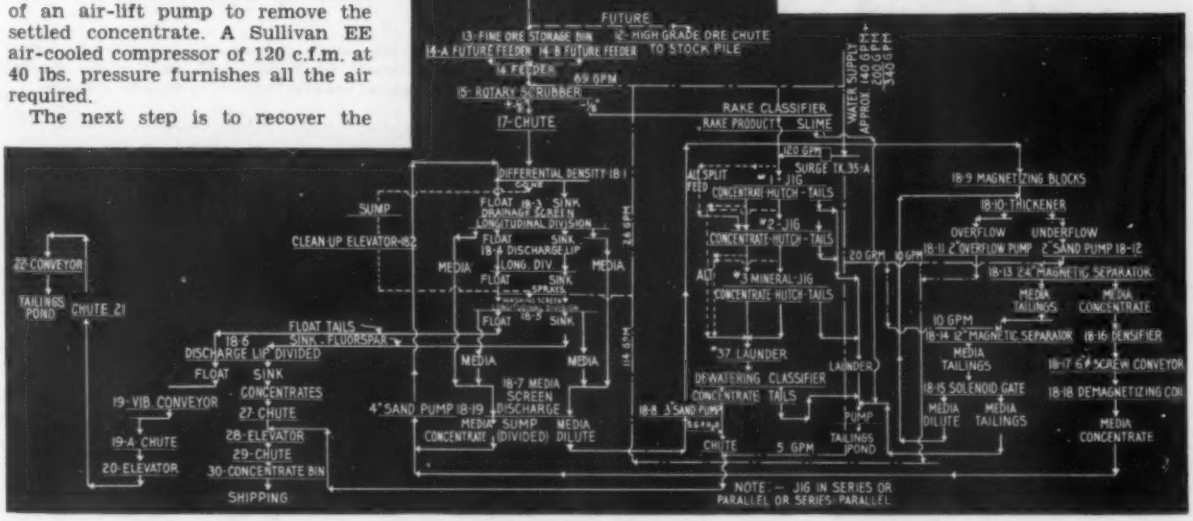


Close-up of heavy medium thickener with plant in background

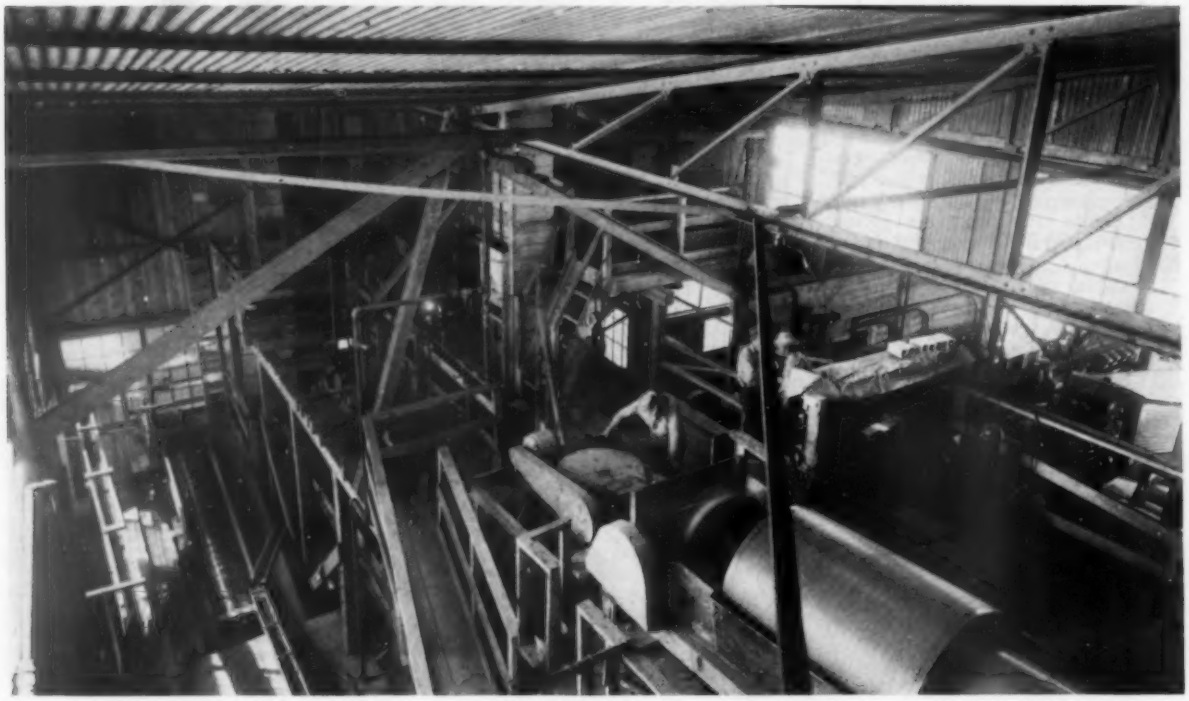
The second step is to put both the sinks and the floats over a similar screen, where they are washed with water sprays. Part of this wash water is that recovered from the thickener, referred to later on. The recovered ferro-silicon in this case is diluted and can not be reintroduced into the cone separator until it has been properly thickened or concentrated. This is done in a 16-ft. bowl and rake thickener (Wemco) of a type probably familiar to all readers.

Since ferro-silicon is magnetic, the liquid first passes between magnetizing blocks (Alnico) to flocculate the particles of ferro-silicon and hasten their settling in the thickener, and to reduce thus the size of the thickener that would otherwise be required. The thickener overflow is pumped back to the washing sprays over the Allis-Chalmers screens, which helps hold down the loss of even the finest particles of ferro-silicon.

The ferro-silicon concentrate from



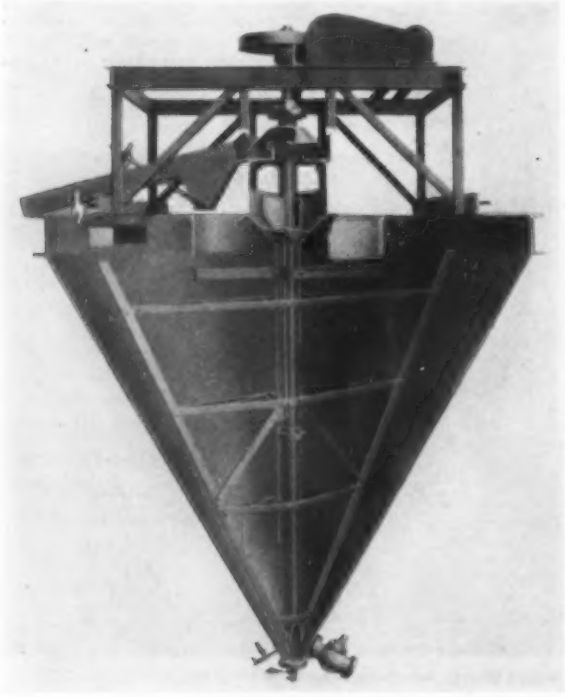
Flow sheet of entire fluorspar recovery operations from mine through flotation process to shipping bins



Showing interior of mill building where sink-float separation is used to concentrate fluorspar. Power plant to the right

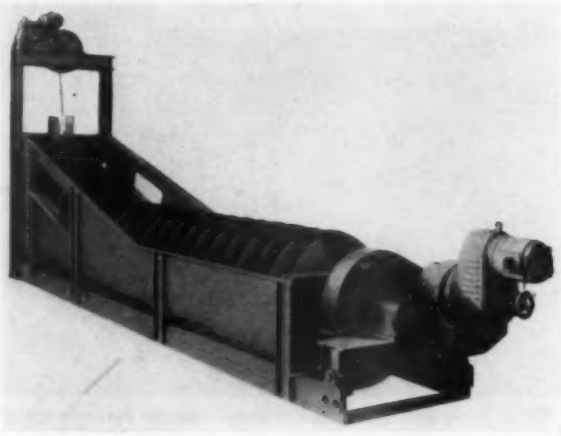
the thickener is pumped by a 2-in. Wemco sand pump through first one and then another Dings Crocket type magnetic separators, the first 24-in. and the second 12-in. The cleaned ferro-silicon from both separators then goes to a 30-in. Wemco densifier, which gives the heavy medium the right density to return to the classifier circuit. The densifier is primarily a screw classifier, with a power equipped lifting mechanism for changing the screw incline, and a variable-speed drive. It acts as a storage for the cleaned medium and provides a means of regulating both the density and the rate of feed to the cone. This density of the medium in the cone is checked every 30 minutes.

In returning the medium (ferro-silicon) to the cone and circuit by a screw conveyor, it first passes over a demagnetizing coil to deflocculate



Left: Cut-away section of cone separator used in sink-float system for concentration of fluorspar

Below: Densifier for heavy-media separation employing ferrous media. After magnetic treatment, the ferrous media flows to the densifier where it is dewatered and then returned to the cone separator

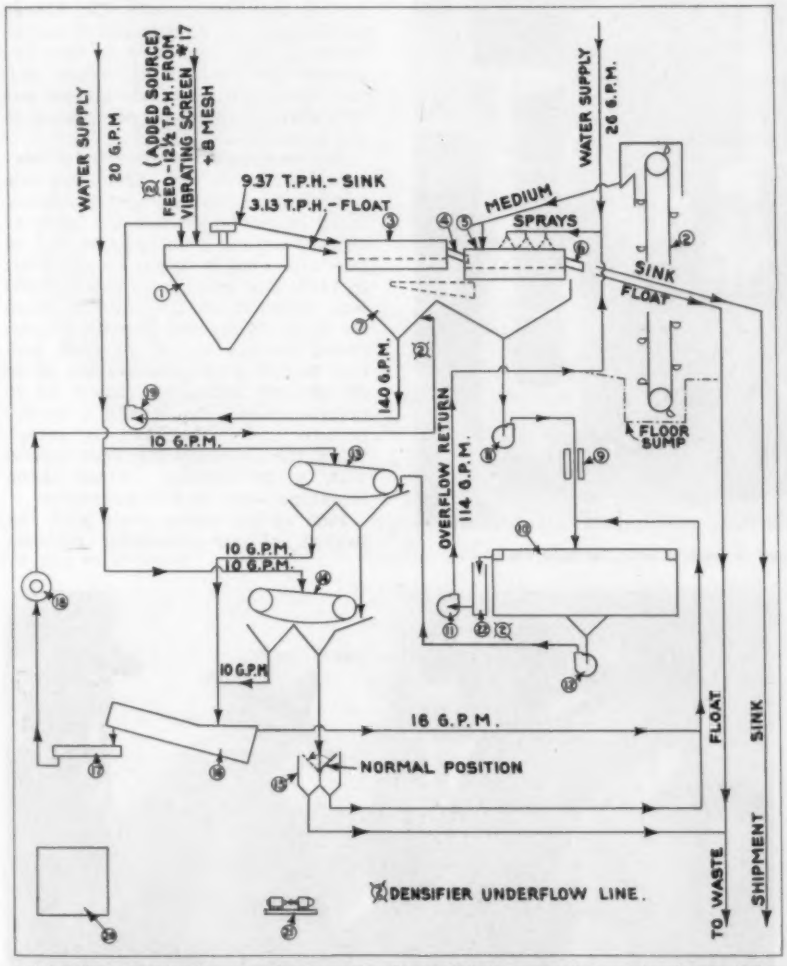


it. The desire at this point is to keep the medium in suspension in the water and not to settle it, so the previous flocculation must be followed by deflocculation. The output of the screw densifier goes to the same sump as the undiluted medium from the first dewatering screen, and is pumped to the cone classifier. To compensate for the small loss of medium that goes out with the waste float material, new ferro-silicon is added. It is this irrecoverable loss that represents the chief cost item—in this case about ½ lb. per dry ton of ore treated, at a cost of about 5c per lb.

The cleaned media is fed to the cone classifier at three different levels in the cone in the upper one-third of its depth.

Power for the plant is furnished by two 8-cylinder 167-hp. Caterpillar diesel generator sets, having 85 kw. output each. A 195-hp. Waukesha-Hesselman Diesel serves as a standby. One of the highlights of plant is the electrical control system, concentrated in a main panel board, which is installed on the cone operating floor, so that the operator there has complete control of all operations. This panel board is so wired with an interlocking system that starting up and shutting down of equipment follows in the necessary sequence of operations, making it impossible to start or stop machines other than in proper rotation. It was designed by Western-Knapp Engineering Co. in conjunction with Westinghouse Electric and Manufacturing Co.

The Gila plant, described here only as to its heavy medium operation, was designed to handle 300 tons per day and make a 75 percent fluorspar concentrate. It was designed by J. A. Barr, chief engineer of the International Minerals and Chemical Corporation in conjunction with the Western-Knapp Engineering Co., San Francisco, Calif. Construction was under the supervision of E. C. Anderson, chief engineer of the potash division of International. H. L. Gardner is superintendent at Gila, which is some 30-odd miles from a railroad.



Original flow sheet for heavy medium operation from which the processing was developed. Subsequent minor changes were made as shown in flow sheet of the plant as a whole. Numerals in circles identify the equipment: 1—Differential density cone; 2—clean-up elevator; 3—drainage screen; 4—discharge lip; 5—media washing screen; 6—discharge lip; 7—screen drainage sump; 8—sand pump; 9—magnetizing blocks; 10—thickener; 11—overflow pump; 12—sand pump; 13—magnetic separator; 14—magnetic separator; 15—solenoid gate; 16—densifier; 17—screw conveyor; 18—demagnetizing coil; 19—sand pump; 20—panel board; 21—motor-generator; 22—sump tank

Diesel Engine Makers Meet

EDUCATORS and the Educational Committee of the Diesel Engine Manufacturers Association recently met in Chicago to discuss the problem of securing better facilities for turning out competent Diesel engine operators.

Gordon Lefebvre, president of Cooper-Bessemer Corporation and chairman of the Educational Committee, said that an effort is being made to have the government release some of the smaller Diesel engines from government wartime surpluses for dismantling and study by students. Several educators decried the inadequate text books on Diesel engines and operation.

Representing F. H. Kilberry, president of Atlas Imperial Diesel Engine Co. as vice-chairman of D.E.M.A.'s educational committee, were M. C. Wright and D. C. Peterson, vice-president and manager of manufacturing, respectively, of Atlas. Mr. Kilberry was unable to attend the meeting.

Others on the committee are Henry J. Barbour, Fairbanks, Morse & Co.; Roland W. Bayerlein, Nordberg Mfg. Co.; Paul J. Every, Baldwin Locomotive Works; George Mueller, General Machinery Corp.; S. S. Sample, Busch-Sulzer Bros.-Diesel Engine Co.; John W. Anderson, American Locomotive Co.; W. E. Wechter, Worthington Pump & Machinery Corp.; Roy A. Hundley, Enterprise Engine & Foundry Co.; Geo. J. Rathbun, Rathbun-Jones Engineering Co.; and Walter A. Parrish and John A. Spalding, National Supply Company.

Big Gravel Contract

DOUGLAS COUNTY, Nebraska, recently opened bids on 41,200 tons of gravel. The Lyman-Richey Sand and Gravel Co. bid at the pit was $54,325 and the Douglas County Gravel Co. bid was $55,490 at the pit. Acme Sand and Gravel Co. bid on only two districts and submitted no pit price.

Correction

RICHMOND SAND AND GRAVEL CORPORATION, with offices in the Southern Trust Building, Richmond, Va., recently sold part of its assets to Southern Materials Corporation, Richmond, Va., but is continuing in business. It was incorrectly reported on page 41 of the September, 1944, issue of ROCK PRODUCTS that the Richmond Sand and Gravel Corporation had discontinued operations.

Meeting War's Demands for Minerals

Industrial Minerals Division of A.I.M.M.E. discusses problems in processing critical minerals

By BROR NORDBERG

STUDIES on a wide variety of nonmetallic minerals were reported on at the Fall meeting of the Industrial Minerals Division, A.I.M.M.E., in Boston, September 27-29. Some of the lesser-known but critical minerals were the subjects for authoritative papers but there were several papers of interest to many producers of more commonly-known commercial minerals.

Group of prominent geologists assembled in front of hotel for field trip

The meeting was held in cooperation with the Boston Section of A.I.M.E. and had an attendance of approximately 80 recognized geologists, scientists and producers of rock products. At the conclusion of the business sessions, the Boston Section was host to a party at the Boston Yacht Club which was followed by the annual dinner. Chester A. Fulton, president of A.I.M.E. and the Southern Phosphate Corp., one of the principal speakers at the dinner, discussed the "Four Freedoms" in their practical aspects and Harlow Shapley, Astronomer, Harvard University, gave an entertaining extemporaneous after-dinner speech.

The Fall Meeting concluded with a field trip into the mica pegmatite district north of Keene, N. H., where some 60 delegates inspected the war-boomed sheet mica mines, mica trimming and preparation plants and the feldspar operations of the Golding-Keene Co. A few stayed for an extra day for a field trip to Beryl Mountain.

Limestone Sand

A paper on "The Manufacture of Limestone Sand," by H. F. KRIEGE, Technical Director, France Stone Co. Laboratories, was read and discussed by A. C. Hewitt, chief engineer, Warner Co., Bellefonte, Penn., in Dr. Kriege's absence. The paper dealt with manufactured and graded limestone sand in its competitive relation with natural sand and generalized on accepted principles of manufacture, covering the crushing with various types of machines and the grading principles in common use. In his opening remarks, Dr. Kriege emphasized the advantages of manufactured limestone sand as fine aggregate in bituminous mixes and portland cement concrete and he was optimistic as to future acceptance of the product.

He mentioned the successful performance with the first concrete pavement constructed with manufactured limestone sand in the State of Ohio. This was a ten-mile stretch of two-lane road in Lucas county built in 1927. The gradation for the 12,000 tons required on the project called for 95 to 100 percent through a ¼-in. round opening screen, 70 to 90 percent minus a 10-mesh screen, 35 to 80 percent minus the 20, 5 to 25 percent minus the 50 and 0 to 7½ percent under 100-mesh. In recent years, the pavement has been topped with a bituminous surface using limestone sand as fine aggregate.

Part of the paper dealt with the subject of air-entraining cements

(Continued on page 63)

J. A. Dennis, vice-president, Golding-Keene Co., left, explaining feldspar milling to a group

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Decorative chromium is put where it *will* show. But we put tons of chromium into cylinders of Diesel and gasoline engines where it *won't* show, although you *can* see the results in greatly increased engine reliability.

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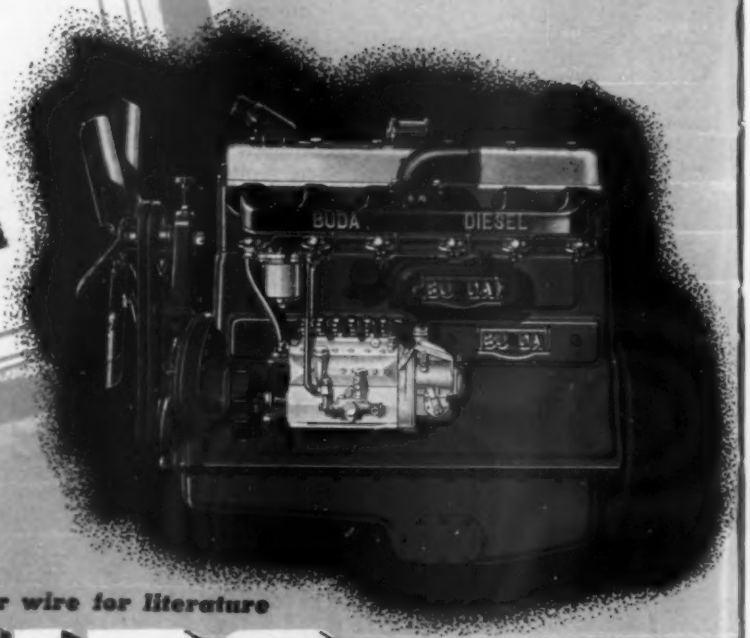

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(Continued from page 60)

and the relation of their use with crushed limestone sand in portland cement concrete. The use of crushed and graded particles for fine aggregate will result in greater air entrainment, according to scientific sources quoted in the paper.

In the discussion of manufacturing principles, Dr. Kriege said that artificial drying is necessary to facilitate screening, when moisture exists in the stone, or wet methods for grading and the removal of excess fines must be adopted. Most plants have adopted the latter. Hammer mills produce large quantities of fines and roll crushers the least, he said.

Among the advantages claimed for manufactured limestone sand were that positive selection can be made of the material, any grading can be produced and the fines are of limestone, freedom from organic impurities, uniformity, whiteness of color, a high modulus of rupture, a good bond between bituminous materials and angular particles and availability in some areas where natural sands do not exist.

A second paper on the subject of stone, "Quarrying of Dimension Stone Without the Use of Explosives," by PIERRE DE VITRY, manager, Patented Marble, Stone and Granite Machinery, illustrated by slides, mainly dealt with the use of channeling machines, the increased use of pneumatic drills and the advantages of the wire saw in the quarrying of stone blocks. The wire saw is not generally used in limestone in this country but, according to the author, is almost universally used in Europe.

Quartz Crystals

There were three papers on the related subjects of quartz and quartz crystals. High grade quartz crystals have been the object of a world-wide search by the Foreign Economic Administration since certain grades had become critical in the prosecution of the war. One of the papers, the "Occurrence, Preparation and Properties of Quartz," by CARL TOLMAN and ROBERT D. BUTLER, both of the Foreign Economic Administration, and RICHARD E. STOIBER, Office of the Chief Signal Officer, covered the occurrence and exploitation of deposits in some detail, particularly in Brazil from which country we receive most of our high-grade quartz. Large quantities of water-clear and colorless quartz are essential to the manufacture of oscillators for radio communications. Preferred sizes are 200 to 700 gm. which are free from bubbles, inclusions, etc. Quartz for this purpose must meet very rigorous specifications under inspection of the U. S. Bureau of Standards and is rated in four quality grades according to the percentage, free from defects, that is usable. Prices range from $2 to $46 per pound.

The average operation in Brazil, the source of practically all high-grade quartz, is small and a monthly production of one to two tons is the biggest for any single operation. However, there are a lot of operations. The ratio of recovery is very low and ranges from 3500:1 to 100,000:1. Most of the quartz has been taken from shallow workings in weathered residual or alluvial deposits, although some mining is to be started. Most of the quartz is from veins rather than pegmatites and its occurrence usually is associated with manganese stains and a weathered red clay overburden. Recovery methods are simple, involving much manual handling, hand picking and cobbing. According to the authors, great quantities of discarded fused quartz have been accumulated in Rio de Janiero.

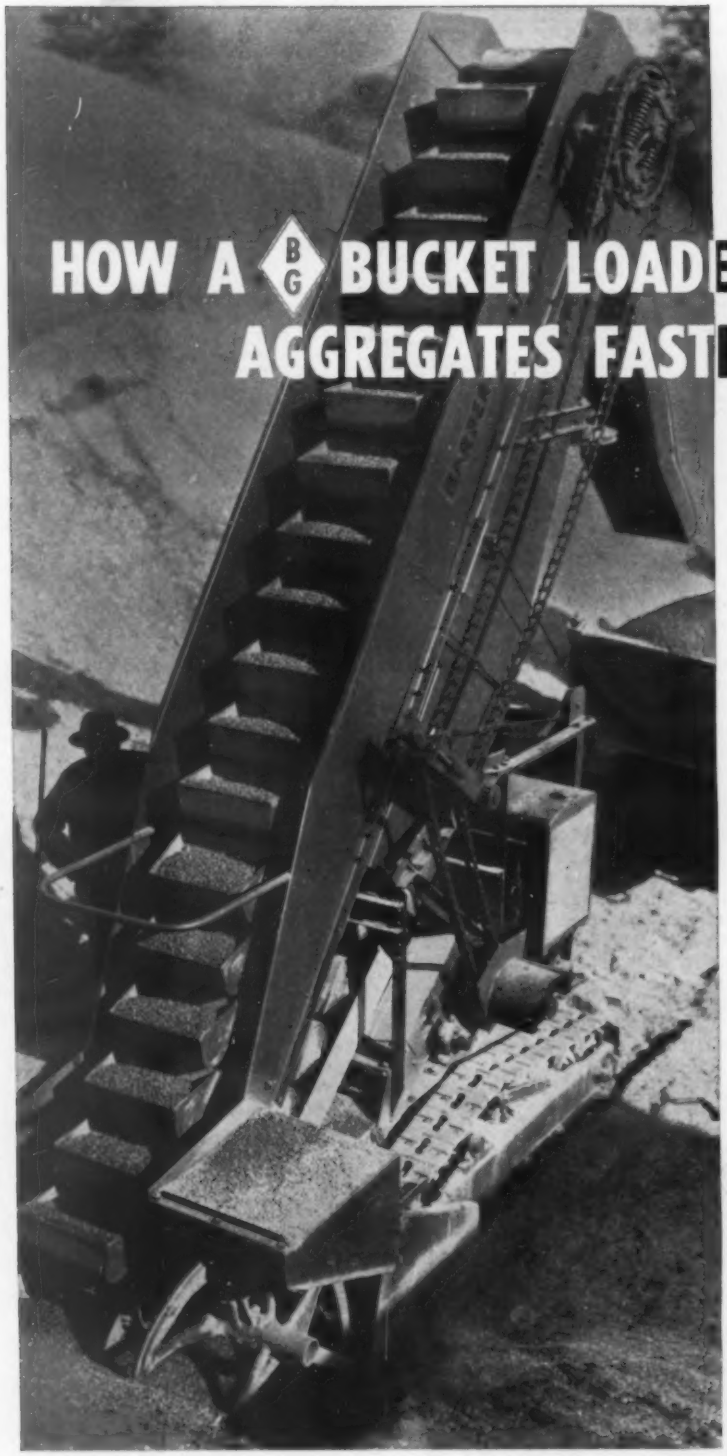
Following this paper, R. B. MCCORMICK, Miscellaneous Minerals Division, W.P.B., told why quartz crystals are critical to the war effort in a paper, "The Manufacture of Quartz Crystals." Quartz crystals are the only means of accurate frequency control in radio communications which, as Mr. McCormick expressed it, enables our armed forces in the field to make immediate contact with their command posts. The types of crystals required were illustrated by slides. In the discussion that followed, R. B. Ladoo, chairman of the specifications committee, Industrial Minerals Division, pointed out some of the properties of fused quartz that will be of value for physical, chemical and optical apparatus. Among them are a low coefficient of expansion, high electrical resistance at high temperatures and a high efficiency of transmission of radiant energy.

G. RICHARDS QWINN, Nonmetal Economics Division, U. S. Bureau of Mines, in his paper, "Mining Optical Crystals," discussed operations for the recovery of quartz crystals, optical clear calcite and fluorite. Mining of these crystals is a costly operation

(Continued on page 66)

Edward Ellingwood, chairman, New Hampshire Minerals Resources Committee, center, explaining geology of New Hampshire mica

The "Institute" goes underground into Blister mica mine



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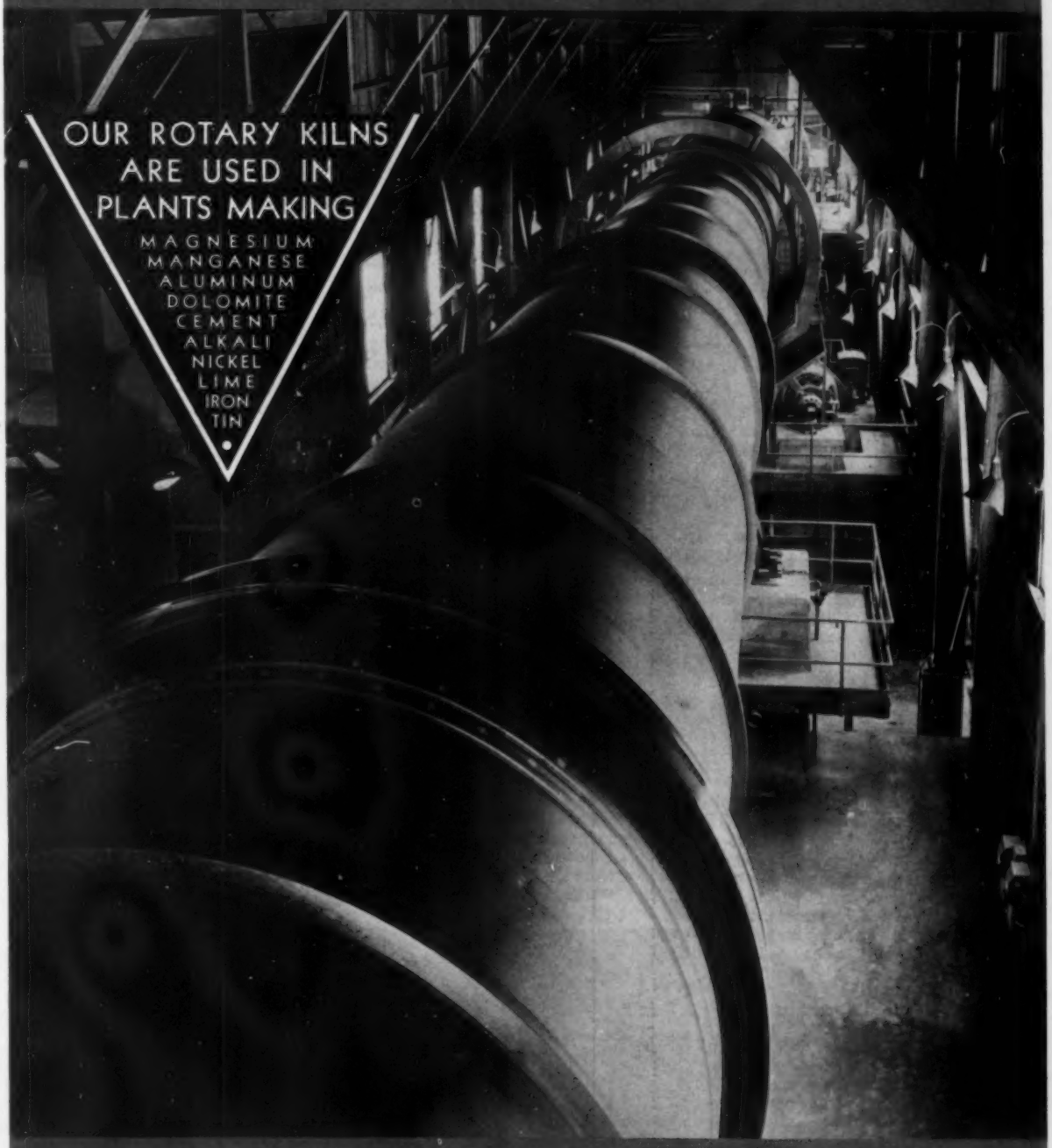

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Trimming mica sheets with power trim saw at Keene, N. H.

(Continued from page 63)

since the ratio of recovery is very low. Mr. Quinn went into considerable discussion of the face crystals desired.

Fullers Earth

H. L. KING, formerly associated with the Attapulgus Clay Co., now with Johns-Manville, discussed operations in the Georgia-Florida area in his paper, "Fullers Earth." In the Attapulgus operation, where 15 to 50 ft. of overburden has to be removed in order to work a 7-ft. bed of fullers earth, he said that stripping costs have been cut 50 percent since he last described the operation in 1930, by substituting a 165-ft. boom 6-cu. yd. Bucyrus-Erie Monighan dragline for steam shovels. In removing overburden, practice is to leave a 2-ft. thickness to protect the fullers earth from weathering.

Mining is done by power shovel or dragline and processing comprises crushing, drying and sizing operations. Air flotation separation is utilized for limerock removal. The bulk of the production is consumed in the purification of petroleum products, waxes and fats and vegetable and animal oils. According to the author, since 1930 the trend in sales has been downward since other absorbents have come into the market and improvements in petroleum processing have reduced requirements, but extensive markets still exist. One relatively new use is as a substitute for sawdust on the floors in machine shops. There is less slippage and a fire hazard is removed by its use in this application.

Fluorspar, Barytes, Beryl

The occurrence and exploitation of fluorspar deposits in the Eagle Mountains of west Texas were described in a paper, "West Texas Fluorspar," by GLENN L. EVANS, Bureau of Economic Geology, University of Texas. Prospecting field work was done in this area in 1943, where

Measuring mica sheets against standards for size grade at Keene, N. H.

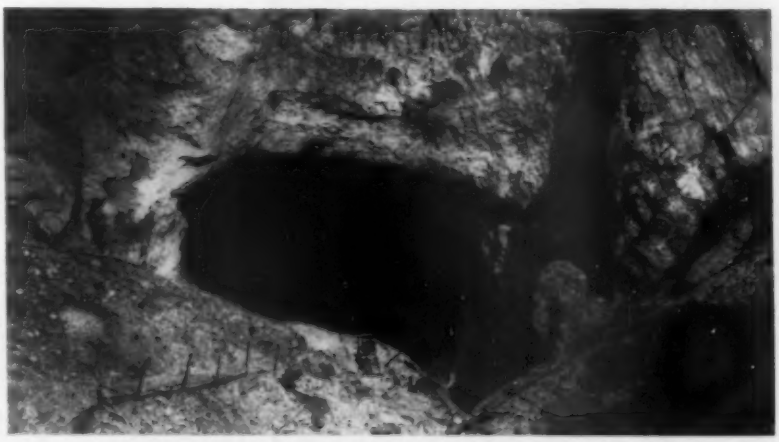
the fluorspar occurs as a replacement to limestone in a six by seven mile area. Most of the area has too much host rock and silica to meet commercial requirements but some of the replacement sections are now being worked on a commercial scale by the Western Fluorite Co. Some metallurgical grade as well as milling grade fluorspar is being mined. The concern has produced 4000 tons of high-grade fluorspar to date. A flotation and jig mill is now being installed for beneficiating low grade fluorspar.

C. O. CAMPBELL, mine manager, Canadian Industrial Minerals, Ltd., described the production of barytes at Walton, Nova Scotia. The Walton deposit, located 70 miles northeast of Halifax and 2½ miles inland from the Atlantic Ocean, is one of the largest baryte deposits in the world. Operations began at Walton in 1941 and production averaged 20,000 tons a year for three years. Production in 1944 will reach 120,000 tons, principally for U. S. consumption in drilling muds. Excavation is done by open cut methods, requiring the removal of clay overburden with gasoline shovels. The barytes deposit is drilled with drifters. Crushing is done through a hammer mill and fine grinding is accomplished through a Williams mill.

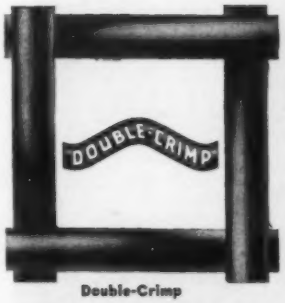
At the processing plant, 2½ miles distant, the trucks dump to a Jeffrey feeder and a separation is made over a Tyrock screen. Material minus 1-in. is put through an Akins classifier and the overs over a picking belt. After screening, the products are stored in bins of 10,000 tons total storage, over a tunnel with a belt conveyor for reclaiming to a dock for loading ships. Fine ground barytes are produced through a high-side Raymond mill through which heated air is circulated, and is bagged in 100-lb. bags by a 4-tube bagging machine. At the conclusion of Mr. Campbell's paper, O. C. Ralston remarked that there is a deposit of comparable size in Arkansas.

S. BENEDICT LEVIN, Mining Engineer, U. S. Bureau of Mines, described the beryllium deposits on Beryl Mountain, in New Hampshire, which has a remarkable concentration of scattered beryl crystals in

(Continued on page 104)



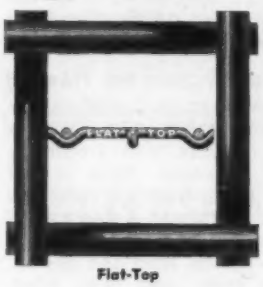
Looking into opening of Victory mica mine being worked on 110-ft. level



Double-Crimp

Arch-Crimp

Intermediate-Crimp



Flat-Top

"The Perfect"

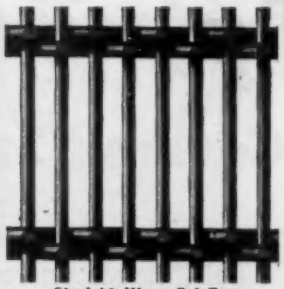
Wire Cloths and Screens

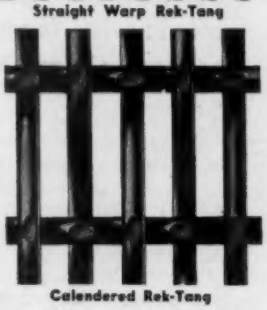
OF

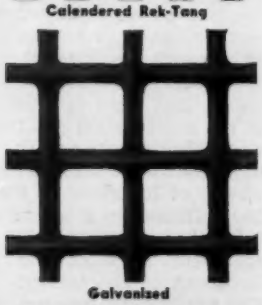
SUPER-LOY STEEL

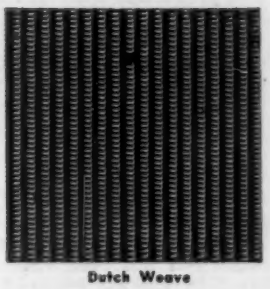
GALVANIZED STEEL
STAINLESS STEEL
NICKEL-CHROME STEEL
PHOSPHOR BRONZE
BRASS
COPPER
MONEL
NICKEL
ALUMINUM

ANY SPECIAL METAL FOR ANY SERVICE


Straight Warp Rek-Tang


Calendered Rek-Tang


Galvanized


Dutch Weave

"Perfect" WEAVES

ARCH-CRIMP
Coiled
DOUBLE-CRIMP
Double-Fill
DUTCH
FLAT-TOP
INTERMEDIATE-CRIMP
REK-TANG
Selvage-Edge
STRAIGHT-WARP
Stranded
STA-TRU
Triple-Warp
Twilled
Twisted-Fill
Twisted-Warp

"Perfect" PROCESSING

Arc-Welding
Bending
Binding
Brazing
CALENDERING
Coiling
Crimping
Cutting
Dipping
Dishing
Finishing
Flanging
Flattening
Forming
Framing
GALVANIZING
Jointing
Knuckling
Painting
Rolling
Selvaging
Shaping
Shearing
Slitting
Soldering
Spot-Welding
Squaring
Stitching
Tack Welding
Trimming

"Perfect" PRODUCTS

Baskets
Circles
Coils
Cones
Cylinders
Discs
Forms
Leaves
Lengths
Panels
Pieces
Ribbons
Rings
Rolls
Sections
Segments
Strips
Templates

Illustrations show items listed in capital letters. Other wire cloths and screens will be illustrated in subsequent advertisements of this series.

Sta-Tru

THE LUDLOW-SAYLOR WIRE CO.

ST. LOUIS 10, MISSOURI

Agstone

Covered Storage Pays

La Salle Stone Quarry, La Salle, Illinois, makes agstone delivery arrangements with farmers direct. Advertises extensively and has county fair displays

Crane at the left is equipped with steel ball to break up stone too large for primary crusher. Shovel to the right loads trucks for transportation of stone from quarry to plant

SINCE the start of operations in 1938, LaSalle Stone Quarry, La Salle, Ill., has been specializing in agricultural limestone. As agstone was to be the principal product, a solicitor was employed to call on all the farmers within a 90-mile radius. He worked with the county agent, who was then advocating soil preparation for the coming demand for crop foods. The solicitor worked with the several farm agencies interested in soil conservation and food production. Booths at county fairs and newspaper advertising established the virtues of limestone in the minds of the farmers. Long before the A.A.A. farm-aid program was set up truckers were busy hauling pulverized limestone to the farms in the area. The production then was 20 tons an hour.

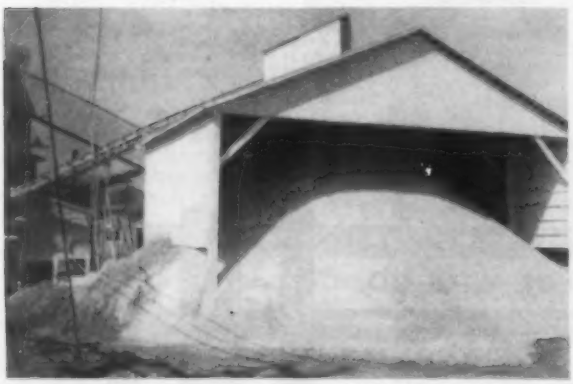
As the demand increased production was proportionately increased. Now the plant turns out 80 tons an hour. Ninety percent of the production is agricultural limestone, the other 10 percent going into "roadstone" for use on farm feed lots, farm driveways, and rural roads. Russell J. Ruffner, general superintendent, says that the increased demand has not been entirely stimulated by the Government farm-aid program. He says the farmer is a smart buyer and must be shown value for his money and that results from liming his soil have stimulated the increased demand. Until recent years the farmers paid cash for their agricultural limestone. Since the A.A.A. program came in, about one-half the buyers are still buying agstone direct for cash while the others have Government contracts. The proportionate share of cash purchasers is much greater than in most of the agricultural areas of the country. Mr. Ruffner is confident that farmers will continue to apply agricultural limestone on their farms regularly, even should Government subsidies be discontinued, which is of course not anticipated.

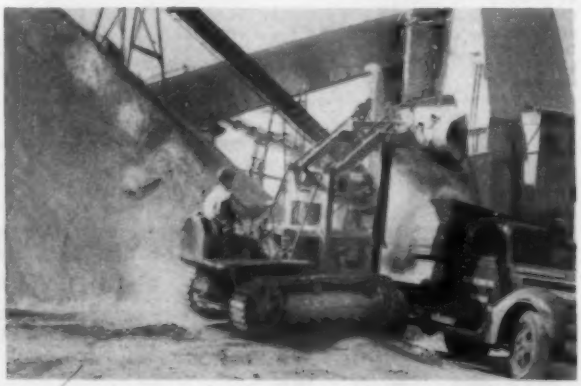
Newspaper advertising has now taken the place of personal solicitation. Large space copy, usually two or three columns, appears regularly in the newspapers in LaSalle, Ottawa, Streator and Princeton, the principal cities within the hauling area. The theme of the copy is "to increase soil productivity with agricultural limestone." Repetition, keeping everlastingly at it, does the trick and the trucks keep rolling up to the bins or stockpiles.

A sound business axiom has it that a sale hasn't been made until the material has been delivered and the customer has paid the bill.

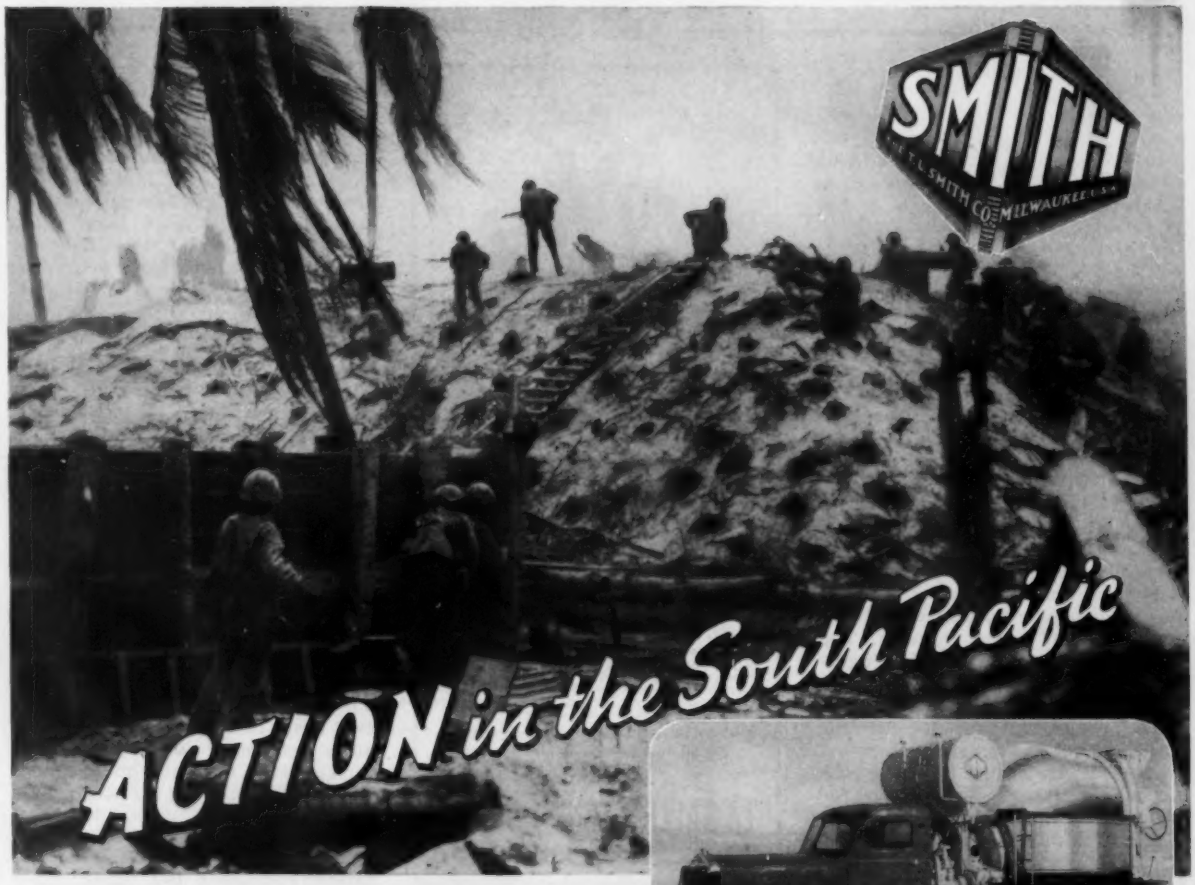
Depend on Truckers for Hauling

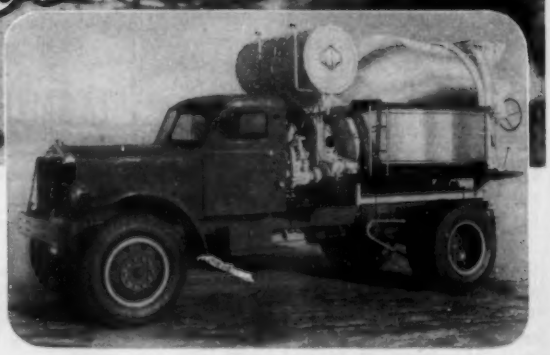
The quarry, having no delivery or spreading equipment of its own, depends on truckers who frequently initiate the business. Back in the early days of agricultural limestone enthusiasm, a farmer would call a trucker and ask him to deliver several hundred tons from the quarry. Before the order had been filled, usually after the first or second load, a neighboring farmer would stop the



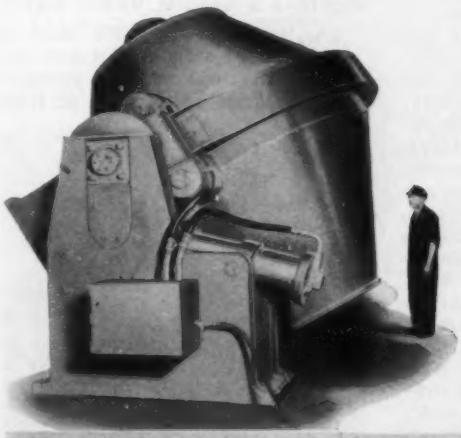


Left: Agstone is stockpiled under cover eliminating trouble from wet stone and freezing in winter. Right: Much time is saved in loading from stockpile with this unit





Out Where Speed and Dependability are "Must" Orders, SMITH TILTERS and SMITH-MOBILES are Pouring Fortifications!



Smith-Mobile charges faster because the wide feed chute has no obstructions—no shafts or rods to clog it up. *Smith-Mobile* mixes faster and better because of its patented "T" shaped spiral blades. It mixes without pressure against the discharge door. *Smith-Mobile* discharges under complete control, either fast discharge or a wheelbarrow full at a time. You can open the end door and inspect the concrete while the drum is mixing. *Smith-Mobile* is simple and rugged with fewer "gadgets" and therefore fewer troubles.

Write today for booklet giving the details.

The T. L. SMITH COMPANY
2885 N. 32nd STREET • MILWAUKEE 10, WISCONSIN

CONCRETE MIXER MANUFACTURERS SINCE 1900

A 4522-1P

trucker and arrange for an order to be delivered to his field. The next load would then go to the second farmer. This would go on until the trucker was in the midst of four orders from as many farmers. The company was, by that time, in the middle of a muddle. None of the orders were being completed, therefore, none of the orders were due for payment.

Something had to be done that would assure the farmer that he would get his limestone when he was ready for it; make it possible for the trucker to stick to his hauling rather than busy himself with getting new business; to keep up the flow of cash back to the quarry to meet payrolls.

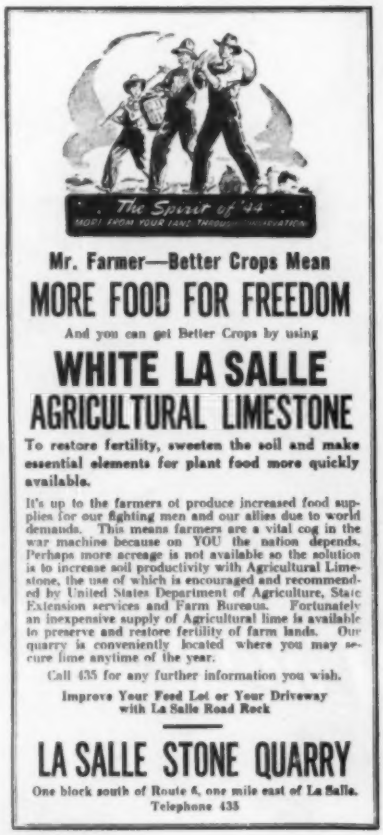
Today farmers are encouraged to phone the quarry first but, when a trucker comes in and reports that a certain farmer wants 200 tons of pulverized limestone delivered to his fields, the quarry makes out an order form for the farmer to sign. The order is made out in duplicate naming the trucker as agent for the farmer in the transaction. The truck is then loaded out with the first installment of the order and the trucker is instructed to have the farmer sign it. One copy is to be returned to the quarry when the second load is picked up. The terms of the order are clearly stated and provide that both delivery and payment will be made within the following thirty days.

When the signed order is returned, the quarry office is careful to mail an acknowledgment to the farmer. The farmer also receives a telephone call and is thanked for the business. Since the farmer is dealing with the quarry through the trucker it is deemed wise to handle the order in this way to avoid misunderstandings later on. The nicest part about the whole thing is that it works. More farmers are doing business direct with the quarry which maintains a list of truckers who can be kept busy without stopping to pick up orders along the way. Losses to the quarry have dropped to almost nothing.

Quarry Operations

LaSalle Stone Quarry, situated just off Highway 6, one mile east of La Salle, Ill., produces limestone testing 98.6 percent $CaCO_3$ with 95 percent passing a No. 8 screen. The analysis is checked about once each month. The fineness will vary according to the condition of the hammers, of course, but hammers are changed, according to test analysis, so that the product will stay well within the limits of Government fineness specifications.

The word "compact" describes the quarry operation. A gasoline-powered


The Spirit of '44
Mr. Farmer—Better Crops Mean
MORE FOOD FOR FREEDOM
And you can get Better Crops by using
WHITE LA SALLE
AGRICULTURAL LIMESTONE
To restore fertility, sweeten the soil and make essential elements for plant food more quickly available.
It's up to the farmers of produce increased food supplies for our fighting men and our allies due to world demands. This means farmers are a vital cog in the war machine because on YOU the nation depends. Perhaps more acreage is not available so the solution is to increase soil productivity with Agricultural Limestone, the use of which is encouraged and recommended by United States Department of Agriculture, State Extension services and Farm Bureaus. Fortunately an inexpensive supply of Agricultural lime is available to preserve and restore fertility of farm lands. Our quarry is conveniently located where you may secure lime anytime of the year.
Call 435 for any further information you wish.
Improve Your Food Lot or Your Driveway with La Salle Road Rock
LA SALLE STONE QUARRY
One block south of Route 6, one mile east of La Salle.
Telephone 435

Typical agstone advertising carried in local newspapers within hauling radius

Link-Belt Speeder crane and a gasoline-powered Link-Belt Speeder ¾-cu. yd. shovel strip the overburden which varies from 5 to 25 ft. above a 30-ft. ledge of rock.

The overburden is loaded into a 5-ton International dump truck and dumped into the quarry. Usually two trucks are kept busy loading and dumping top soil. The overburden is piled in one spot against the face of the quarry. Quarry operations are then carried on around the pile, which, when the face recedes, becomes an island within the quarry. Operating two trucks and a crane has reduced the cost of handling overburden, to 5c per cu. yd., according to Mr. Ruffner, as against 11c per cu. yd. when hauling was done to a point behind the quarry. Drilling is done with a Chicago Pneumatic wagon drill. Holes are spaced 6 ft. apart, with a 7-ft. burden, to the full depth of 30 ft. Holes start at 2⅝ in. and drop off to about 2 in. Holes are charged with 2- x 8-in. sticks of American Cyanamid dynamite. Ten holes are shot at a time. The yearly average of rock displacement will run 3-7/10 tons of stone to one pound of dynamite in primary blasting.

When the face is blasted down, the Link-Belt Speeder crane, now using a 3000-lb. ball-breaker, takes the place of secondary drilling and blasting in the quarry, and a gasoline-powered ¾-cu. yd. Marion shovel loads the rock into the trucks. Two 5-ton D-40 International dump trucks operate between the rock face and the mill, a distance of a quarter of a mile.

Crushing and Screening

At the mill the trucks dump into a hopper from which an Iowa Manufacturing Co. apron feeder regulates the flow of stone into an 18- x 38-in. Badger jaw crusher which reduces the rock to 3-in. minus. The feeder is belt-driven off the flywheel of the jaw crusher. A 100-ft. conveyor belt carries the rock to a 3- x 10-ft. Productive Equipment Co. Selectro double-deck vibrating screen where fines, minus ¾-in., are scalped out and dropped into the road rock bin. Surplus road rock is moved over a 60-ft. conveyor belt to the stockpile. The ¾-in. up to 3-in. is run through two Dixie hammer mills, one 30- x 40-in., the other 40- x 40-in., each direct-driven by a 100-hp. Westinghouse motor through a flexible chain coupling. Overloading is detected by watching ammeters and the feed is changed accordingly. O No. 45 Sturtevant Planovane fan blower picks up the dust through an intake above the hammer mills and discharges it to the atmosphere. Plans are under way to salvage this dust.

Two 50-ft. Link-Belt bucket elevators lift the pulverized limestone into the bins. There are two agstone bins and one bin for roadstone. These Blaw-Knox bins each have a capacity of 75 tons. The surplus limestone is moved over a 60-ft. conveyor belt to the limestone stockpile shed.

Agstone Stockpile Under Cover

The limestone stockpile shed is well worth the $2500 that it cost. Before the shed was built the stockpile would saturate to a depth of from

Comfortable office has been built with concrete masonry

AMERICA IS
Built with Aggregate!
SMOOTHER BEDS
Building the nation's vast network of railroads created a market for countless millions of tons of aggregate and each year millions more should be added to keep them smooth. During the past few years this has been impossible because of labor shortages.
The outlook now is for ballast to be one of the big markets for producers of crushed stone and gravel. The railroads have plenty of funds available for track maintenance and, if the supply of labor permits, they will use it for that purpose.
Cedarapids aggregate producing
for RAILROADS!
and crushing equipment will help you produce better aggregate for ballast, highways, airports and other construction jobs, and it will cost you less too. Remember this — the Cedarapids line is complete and will meet any aggregate production problem either from the standpoint of output or character of materials for either an entire plant or a single piece of equipment. You'll be way ahead if you come to Iowa now for your essential needs and be one of the first in line for postwar deliveries. See your Iowa dealer right away or write direct.
IOWA MANUFACTURING COMPANY
CEDAR RAPIDS, IOWA
CEDAR RAPIDS
ARMY E NAVY
Ewing Galloway Photo
Cedarapids
Built by IOWA
THE IOWA LINE
of Material Handling Equipment Includes
ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS—STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS—TRAPS
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

Strip overburden with shovel and haul away waste to worked out part of quarry

3 to 4 ft. after a hard rain. Then it would freeze under sub-freezing temperatures. When the weather cleared and hauling could be resumed it was found that the limestone would not spread. At first the affected limestone was taken off and dried out. That didn't prove economical. It wouldn't go through the spreaders and there were complaints. Then regrinding was tried but that only clogged the hammer mills. Then it was decided to remove the crusted stone and haul it away to some spot in the quarry. Since there were usually two piles run up during the winter bad weather season it would be necessary to load and haul some thousand tons of stone before the truckers could be served. This meant a loss of the tonnage, plus the time and expense of disposing of it. The shed over the limestone stockpile offers protection on top and three sides and is open at the south end.

Truckers load from overhead bins where a Winslow scale determines the weights. Stockpile loading is done with a D-2 Diesel Caterpillar tractor equipped with a front end loader or with the ¾-cu. yd. Link-Belt Speeder shovel. Stockpile loads are checked at the office on a Winslow platform wagon scale.

Every quarry man is trained to do two or more jobs. He can work in the quarry or in the mill. He can run a crane, a truck, or operate a shovel. He can work in the machine shop where all of the repairs and overhauling is done. Equipped with an electric welder, a lathe, an air compressor, general shop equipment and tools the shop provides plenty of maintenance work during periods when quarry operations are stopped by bad weather.

It is estimated that 150,000 tons of agricultural limestone and 15,000 tons of roadstone were shipped from the quarry in 1943.

Cephas Williams is the owner of the LaSalle Stone Quarry and Russell J. Ruffner is general superintendent.

Senate's Highway Bill

BEFORE recessing for the national election the Senate of the United States passed the Hayden bill S. 2105 for federal aid highways. The House of Representatives recessed without acting on either its own or the new Senate bill. J. R. Boyd, administrative director of the National Crushed Stone Association, has made a comparison of the two bills as follows:

(000 omitted)

	H.R. 4915	S. 2105
Federal-aid system	$225,000	$200,000
Sec. and feeder roads	125,000	125,000
Urban highways	150,000	125,000
Forest highways	25,000	25,000
Forest develop. roads	12,500	12,500
Parks and monuments	4,250	4,250
Parkways	5,000	5,000

The Senate bill provides $450,000,000 annually for federal-aid highways, farm-to-market roads, and urban streets, as compared to $500,000,000 in the House bill.

An important provision of the Senate bill would make available immediately upon apportionment $100,000,000 for the making of surveys and plans and for construction. Provision for the acquisition of rights-of-way included in the Senate bill as originally introduced was eliminated by floor action.

Differing basically from the House bill, the Senate version directs the distribution of funds for projects on the Federal-aid system as provided in Section 21 of the Federal Highway Act; that is, one-third area, one-third population, and one-third road mileage.

Funds available for projects on secondary and feeder roads shall be apportioned on the basis of one-third in the ratio which the area of each state bears to the total area of all the states; one-third in the ratio which the rural population of each state bears to the total rural population of all the states; and one-third in the ratio which the mileage of rural delivery and star routes in each state bears to the total mileage of rural delivery and star routes.

Funds available for projects on highways in urban areas shall be apportioned in the ratio which the population in municipalities and other places of 5,000 or more bears to the total population in municipalities and other urban places of 5,000 or more in all the states.

Under the Senate bill the states would be required to match Federal funds on a fifty-fifty basis, whereas the House bill provides for a sixty-forty basis for the first year and for a fifty-fifty basis for the two successive years.

Overall view of La Salle Stone Quarry crushing and screening plant. Note truck to left dumping stone into primary crusher

BASIC ★ ★ ★

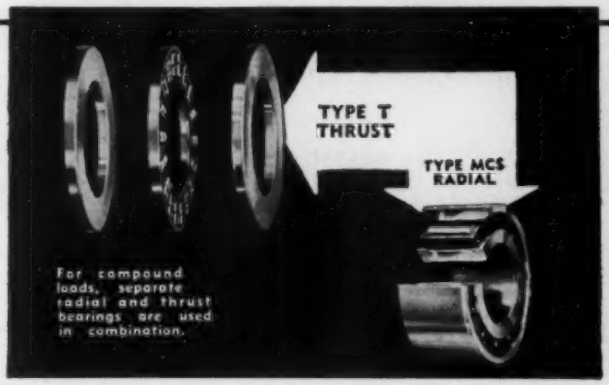
IN YOUR PLANS TO KEEP POSTWAR

MAINTENANCE COSTS DOWN . . .

ROLLWAY

Right-Angle

BEARING LOADING



Costs must come down—especially maintenance costs—if you want to weather the storms that peacetime readjustment of prices, markets and competition will bring.

So make a practical start now. Change over your production machinery to Rollway's right-angle bearing loading. That will cut maintenance cost and replacement cost . . . it will free your production machinery from frequent shut-downs for bearing replacements.

Design your postwar products around the Rollway bearing principle, too. You'll get higher load capacity and longer life expectancy in given dimensional limits. You'll get more compact design, a better operating, more satisfactory product with less maintenance trouble.

Right-Angle Loading Reduces the Unit Load

Rollway's right-angle Bearings limit the load carried by each bearing to a single load component —either *pure radial* or *pure thrust*. The unit load per roller is lower, the load capacity for a given dimension is higher. No oblique loads or resultants, no compound loads of any kind can pile up to increase the computed load beyond the elastic limits of the structure or housing. Resistance to shock and vibration is increased. Pinch-out of rollers is eliminated—there's less end-rub, less wear-back of roller ends. Longer bearing life and lower maintenance and replacement costs are normal results.

Standard Sizes for Most Applications

S.A.E., or American Standard metric dimensions and tolerances assure low cost and ready availability for most applications. Let our engineering specialists help you in making a correct selection. Just send a drawing or detailed description. No charge or obligation for a free, confidential analysis and recommendation.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, NEW YORK

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 **BEARINGS**

SALES OFFICES: Philadelphia • Boston • Pittsburgh • Youngstown • Cleveland • Detroit • Chicago • St. Paul • Houston • Tulsa • Los Angeles

Efficient Operation of Rotary Kilns

Part 8: Thermal efficiency depends on the recovery of equipment surface losses and terminal product losses

By RALPH GIBBS*

USERS of rotary kilns are becoming increasingly interested in the thermal efficiency of these tools. However, the problem still is in a state similar to that of Mark Twain's terse observation concerning the weather; there is a great deal said about thermal efficiency but not much is being done about it.

Ordinarily there are two major thermal losses attending every rotary kiln operation. These are:

(a) Equipment surface heat losses.

(b) Terminal product heat losses.

Equipment surface losses are those heat units that travel through the confining walls and dissipate into the surrounding atmosphere and objects by radiation and convection. Effective thermal insulation, where practicable, is about all that can be done to reduce this loss to some optimum minimum. This has been discussed in a previous article.

Terminal product losses, however, generally are of greater magnitude and therefore of greater economic significance. They are, furthermore, subject to some manipulation hence much of it can be utilized. Like all continuous exchange processes where there is practically a continual flow of materials, there are those materials being processed and those performing the processing. In most instances where the rotary kiln is being used, the flows of these materials are counter-current, so we have the desired processed product being discharged at one end and the exhausted processing material discharged at the other end of the gigantic tube.

With only the bare equipment necessary to carry out the process, tremendous terminal heat losses would occur, since comparatively high temperatures are required to bring about the desired state of the processed material and it is essential that the necessary temperature be sustained for some suitable period of time. However, after this necessary time and temperature effect has existed, for all purposes insofar as the processing itself is concerned, the processed material is done with and could be discharged from the equipment forthwith. This would mean that the temperature of the discharged product would be substantially that of the processing temperature.

As an example, in burning dolomite granules for use in basic open hearth steel furnaces, quite high temperatures are required to shrink the particles properly, especially in the absence of an agent to promote shrinking. At times this temperature approaches 3500 deg. F. Should this material at this temperature be discharged without attempting to recover the heat available, it would represent a loss of at least 128 lbs. of 13,500 b.t.u./lb. coal for each ton of material discharged. Consequently reasonable efforts should be made to recover as much of this heat as possible.

In most cases attempts are made to return at least a portion of this heat to the kiln, in the form of preheated air for combustion.

Since considerable heat is utilized in raising the temperature of the air used in the combustion process, this application offers a simple and convenient means for usefully applying the greater portion of the heat in the hot discharged material. And, since preheated air permits the development of higher flame temperatures, more radiant energy will be available to the actual processing taking place in the kiln.

Coolers

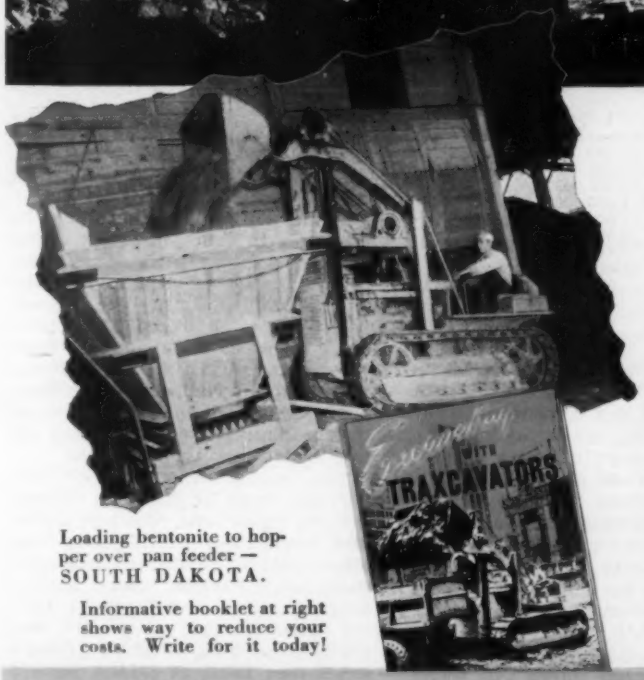
This very desirable heat transfer between the hot discharged material and the cold air for combustion is usually attempted in the so-called coolers. It is true that generally these pieces of equipment are properly named since they do deliver the finished product at a temperature which can be handled with reasonable safety although there are cases on record where elevator or conveyor belts have been burned up and where box cars have been set afire. To say that these coolers are thermally efficient, however, would bring up the question of doubt.

A cooler, to be thermally efficient, must be designed along lines and principles which make use of the known laws governing heat transfer.

Since at this point we are dealing with the transfer of heat between a solid and a fluid it is highly desirable that those principles which facilitate this transfer be incorporated in the cooler design. At least two factors are of paramount importance. The first is relative high velocity between the solid and the fluid, and the sec-

*Consulting chemical engineer.

HANDLING COSTS BLASTED



Loading bentonite to hopper over pan feeder — SOUTH DAKOTA.

Informative booklet at right shows way to reduce your costs. Write for it today!

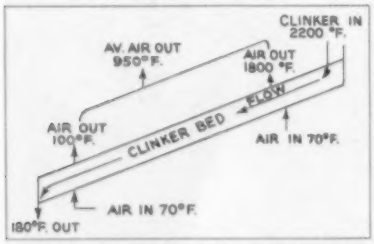
WITH TRAXCAVATORS on the job, handling costs take a terrific blasting! These compact, rugged tractor excavators get into the closest quarters and load out the "pay dirt" in a hurry. The Model T2 TRAXCAVATOR, shown above, in a Pennsylvania limestone quarry loads between 350 and 400 tons of rock in an eight hour day — doing the job easier, faster, and at lower cost than any previously used method. But these versatile, multi-purpose machines do *More!* They maintain haulage roads, do clean-up jobs in the pit and around the plant, drawbar work, and a host of other tasks. Powered by "Caterpillar" track-type tractors, TRAXCAVATORS are unmatched time, money, and labor-savers, are available with bucket capacities from ½ to 2½ cubic yards. See your TRACKSON-"Caterpillar" dealer today, or write for literature to Trackson Company, Milwaukee 1, Wisconsin.

TRAXCAVATOR

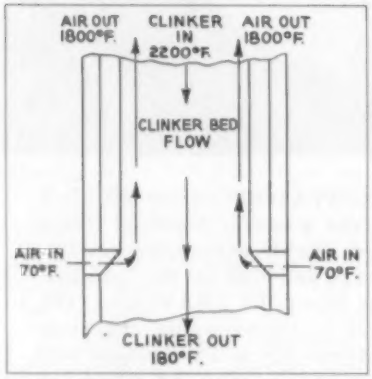
The Original Tractor Excavator

ond is counter-flow of the two substances involved.

In order to have a condition of high relative velocity between the fluid and the solid it will be necessary to force or draw the fluid through a bed of the solid. Simply to allow the solid to trickle through a slowly moving fluid will not accomplish the same result in the same time. Consequently by forcing the fluid through a bed of the solid particles a much smaller piece of equipment can be used in which this heat transfer will take place.



Cross flow action in cooler results in higher terminal temperatures



Counterflow action in cooler results in uniform final temperatures

The use of the counter-flow principle as compared to cross-flow is shown in the accompanying figures. It will be seen that with counter-flow the final temperatures are uniform and constant whereas with cross-flow the temperatures are varying and average. Furthermore, with cross-flow, the temperature differences are smaller so that the final temperatures are higher for equal bed conditions. However, this feature of cross-flow can be largely overcome by having the fluid make several passes through the bed of solid instead of a single pass.

The cooler also should have a low surface heat loss. Undoubtedly in the ordinary rotary cooler most of the heat of the discharged material is discharged through the shell rather than to the air it is suppcsed to preheat. There are instances where the cooler shells are continually bathed in water while others have cooling fins welded to the shell to dissipate the heat. Such coolers are just coolers, not equipment to conserve heat.

Heaters

The terminal loss at the discharge end of the rotary kiln can be controlled by a properly designed and arranged cooler. At the feed end of the rotary kiln the terminal heat loss also can be controlled by utilizing the heat in the exit gases.

The exit gases of a rotary kiln ordinarily carry away enormous quantities of heat. This is not generally appreciated since the volume or weight of the exit gases is seldom measured and consequently passes notice. Therefore, let us consider the problem in the following fashion.

With a fuel ratio of 4 to 1 burning lime, the weight of kiln exit gases equivalent to one ton of lime is approximately 7000 lbs or 3.5 tons. In other words, for each ton of lime produced under these conditions approximately 3.5 tons of gas are exhausted or otherwise discharged from the kiln. Table I shows the quantity of heat being carried out by these gases, and the equivalent amount of 13,500 b.t.u./lb. coal this heat represents for different exit gas temperatures with an atmosphere at 70 deg. F.

TABLE I: QUANTITY OF HEAT CARRIED OUT BY GASES

Deg. F. Temp. of exit gas	Btu. lost per ton of lime	Equiv. lbs. coal per ton of lime
1400	2,120,000	158.0
1300	1,980,000	147.0
1200	1,820,000	135.0
1100	1,660,000	123.0
1000	1,500,000	111.0
900	1,340,000	99.0
800	1,180,000	87.5
700	1,015,000	75.0
600	855,000	63.3
500	694,000	51.4
400	532,000	39.4
300	370,000	27.4

It might be argued by some that a high exit gas temperature and a high fuel ratio are not compatible. They are, nevertheless, depending upon the degree of recovery of waste heat at the discharge end of the kiln. Thus we can appreciate the necessity for making all terminal thermal recoveries as effective as possible.

From the above table it is possible to realize how wasteful it is to permit high temperature gases to escape from the kiln.

The cement industry, with its usual thoroughness, has solved this waste problem by the installation of waste-heat boilers, and many cement plants produce more than enough electrical energy to operate their entire plants. Other industries using the rotary kiln, especially the lime and clinkered dolomite industries, are extremely backward in this development.

With the availability of electrical power in almost any locality in these United States the waste heat boiler is not always the answer to the recovery of heat from the exit kiln gases. In many instances the availability of cheap electrical power and the physical condition of the raw kiln feed make it highly desirable to recover the waste heat by preheating the kiln feed prior to its introduction into the kiln.

This recovery is being attempted by various means, all more or less effective. Since we are again dealing with the interchange of heat between a fluid and a solid, as is the case with the cooler, the same general laws are effective. The truly effective preheater will eventually be designed on these principles.

Although power will be required to operate any effective heat exchange device, and depreciation and maintenance items carried against them in their cost of operation, the resulting economy will not be found only in their saving of fuel, but also in the increased production of the unit and the smoothing out of the overall processing operation. It has been stated that kiln output has been increased 40 percent by the installation of fairly effective heat exchange equipment for preheating the kiln feed with the hot exit gases.

Barite Shortage

BUREAU OF MINES reports that growing shortages have marked every phase of the barite industry during the first six months of 1944, except ground bleached barite for paint, rubber, and other filler purposes.

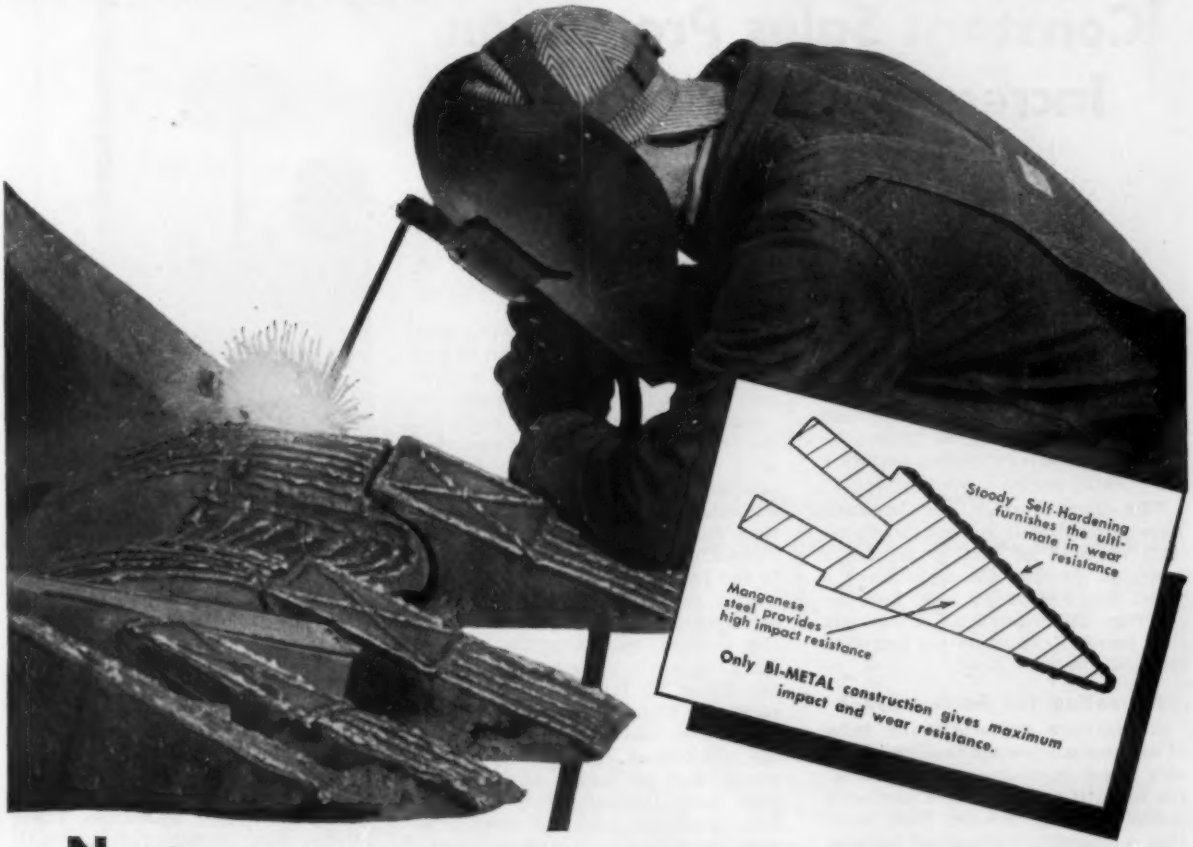
Production of ground barite for oil well drilling, although about twice as great as in the same period of 1943 was insufficient to meet demands for drilling in high-pressure fields, and grinders reported considerable backlogs of orders. Decreased production of barite in Tennessee and Georgia for chemicals, lithopone and glass use slowed production of these essential commodities and cut heavily into consumers' stocks.

Total production in 1942 was 449,873 short tons, by States as follows: Georgia 91,168 tons, Missouri 154,985 tons, Tennessee 84,527 tons, and other States (Alabama, Arkansas, California, Nevada, New Mexico, South Carolina, and Virginia) 119,193 tons. In 1943 production was 429,298 short tons, by States: Georgia 95,422 tons, Missouri 125,024, Nevada 23,208, Tennessee 52,466 tons, and other States (Arizona, Arkansas, California, Kentucky, South Carolina, and Washington) 133,178 tons.

Start Block Plant

FARMERS COAL AND CONCRETE PRODUCTS Co., Jefferson City, Mo., has been furnishing ready mixed concrete, and plans to open a concrete block plant.

BI-METAL CONSTRUCTION
Means Longer Life on Shovel Parts


Stoody Self-Hardening furnishes the ultimate in wear resistance
Manganese steel provides high impact resistance
Only BI-METAL construction gives maximum impact and wear resistance.

NO SINGLE METAL has *both* maximum hardness to resist wear and maximum ductility to withstand impact. Either can be obtained only at the expense of the other and generally, where both impact and wear resistance are required, a compromise between the two must be accepted. This is true of the manganese steel employed for bucket lips, runners, etc.

Stoody Self-Hardening over those areas receiving greatest abrasion offers the ultimate in both impact and wear resistance by providing BI-METAL CONSTRUCTION. The manganese parent stock provides high *impact resistance*. Stoody Self-Hardening *furnishes extreme wear resistance*—considerably greater than obtainable with either manganese or high carbon electrodes.

Stoody Self-Hardening is a natural for use on shovel parts—it is easy to apply and forms a strong bond with manganese steel. Stoody Self-Hardening is not only extremely wear resistant, but will not chip even under severe impact. To equalize wear over an entire bucket surface, it is necessary only to hardface those areas receiving greatest abrasion. By controlling spot wear alone, you lengthen shovel life many times and save down time for routine repairs.

Stoody Self-Hardening is available in both bare and coated rods for D.C. electric application and can be purchased from 600 U. S. distributors. 3/16" and 1/4" diameter rods are priced at 50c per lb. f.o.b. Whittier, California, or distributors' warehouses. Try Stoody Self-Hardening on your next shovel repair and note the increased life from these hard-faced bucket parts.

STOODY COMPANY
1125 W. SLAUSON AVE., WHITTIER, CALIF.

STOODY HARD-FACING ALLOYS
Retard wear . . . Save Repair

Constant Sales Promotion Increases Farm Market

F. W. Sloter Trucking Co., Columbus, Ohio, operates nine transit mixers

Electric sign at cross roads advertises ready mixed concrete to farmers

MANY ready mixed concrete operators are becoming aware of the farm market. Whenever one of them turns to this source for business he finds that educational spade work has already been done by the farm journals and those newspapers featuring lively farm pages.

The dairy farmer, for instance, knows that if he is to meet the standards required of him to market a premium product he must have a plant that will pass a rigid milk inspection. He must have a sanitary milk house. He must have a barnyard that can be kept clean.

Promoting the Farm Market

All farmers appreciate the value of damp-proof storage facilities. They also know that the elimination of fire hazards brings lowered insurance premiums as its reward. They know that a properly constructed building will have a minimum of repair bills and therefore require less labor.

W. W. Sloter of the F. W. Sloter Trucking Co., Columbus, Ohio, found the farm market ready and waiting when he accepted a dealer-help offer from his cement company. All he had to do was to pay the postage on several hundred pieces to be mailed to rural box holders within reach of his office. The mailing piece consisted of a folder describing the uses of concrete on farms and a return card, addressed to the cement company, that would bring a booklet containing additional information of value to the farmer if he wanted it.

The farmers responded. As the cards came to the cement company the booklet was promptly mailed. Then the cards were turned over to Mr. Sloter. He faithfully followed up each one with a personal call. This resulted in many initial orders but the groundwork that was laid for a steady flow of future business was even more valuable. This one-shot sales promotion program resulted in farm orders that represented 16 percent of the total ready mixed business done in 1943 by the company. The relation of farm sales to general sales was determined by carefully examining each order taken through the year. All farm orders were set aside and the total cubic yardage delivered considered in relation to the total business. There was no mistake about it, the farm market was found to be well worth cultivation.

To sustain the farm business, advertising is being carried in five country weekly newspapers within the hauling radius. Two country dealers have been appointed. These dealers, local lumberyards in small communities, are allowed dealer discounts on all business originating with them. Where these country dealers are located in towns having weekly newspapers the advertising carries the dealer's name. The newspapers publish items from time to time that elaborate on the services performed by the company. These are important helps.

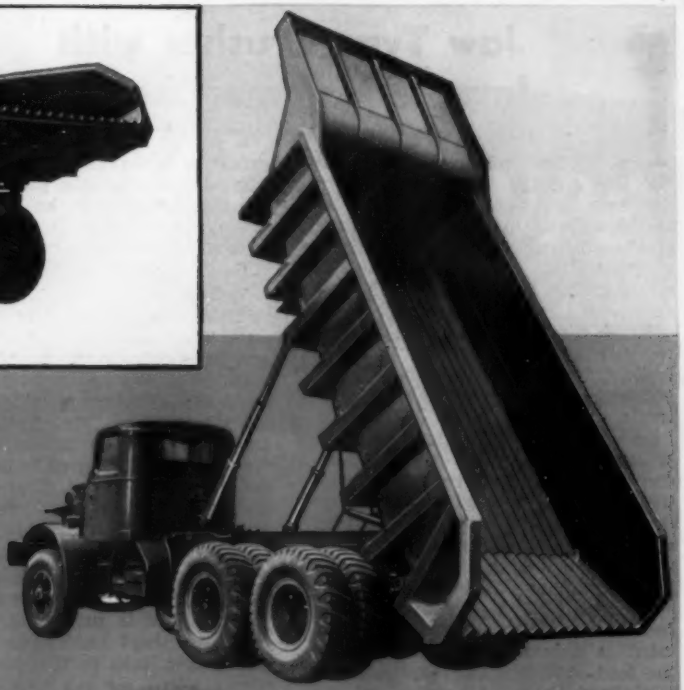
This year an attractive calendar was sent to each customer—both farm and commercial. These serve to keep the name of the company before those who use concrete. A neon roadside sign in front of the office, situated on a farm traveled highway, further advertises the company, its product, and emphasizes the convenient plant location.

F. W. Sloter Trucking Co. was organized many years ago to do a general hauling business. Later the company built a small office building on the grounds of its principal customer, the Jackson Pike Sand and Gravel Co. The need for ready mixed concrete in the area just south of Columbus prompted Mr. Sloter to purchase a fleet of transit mixers. The

(Continued on page 88)

One of a fleet of nine transit mix units operated by F. W. Sloter Trucking Company

Body with open or scoop end (Right) Same body elevated.



X-112 BODIES *and* T-4440 HOISTS *for* OPEN PIT MINING

Body with automatic downfold tailgate.

Fleets of Trucks, equipped with Gar Wood X-112 Bodies and T-4440 Hydraulic Hoists, are hauling the biggest loads ever moved by trucks on production schedules. Lower mining costs have been made possible by speeding up the handling of overburden, ore and coal.

SPECIFICATIONS

HOIST—Hydraulic, twin cylinder, telescopic.

PUMP—Gear type with aluminum wearplates.

POWER-TAKEOFF—2-gear single speed.

BODY—Heavy duty with pressed-steel, box-type side braces and cross members.

BODY SHELL—¼" sheet steel with 2" wood filler.

WEARPLATE—¼" with floor angles or 5/16" without. Longitudinals 8-inch "H" beams.

CAB SHIELD—¼" plate.

FLOOR ANGLES—Optional.

Automatic gate opens as body elevates.

GAR WOOD INDUSTRIES, Inc., Detroit 11, Michigan

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

WORLD'S LARGEST MANUFACTURERS OF TRUCK AND TRAILER EQUIPMENT

Jaw Type Crusher with Impact Hammer Action

ONE of the problems confronting the crushed stone industry is the ever-increasing requirement in specifications that the product of crushers be cubical in particle shape. A great deal of thought has been given to this problem by both producers and manufacturers.

F. H. EDWARDS, general superintendent of the New Haven Trap Rock Co., in seeking to meet this problem, designed and patented the crusher shown in the illustrations. In many respects it resembles a jaw crusher, but it has an impact hammer action which makes it distinctive. It will be noticed in Fig. 1 that it provides a breaker having a fixed anvil and a hammer suspended so that it moves in a horizontal plane thereby making possible a discharge-opening double the width of the feed-opening. The hammer movement is substantially the same at the feed- and discharge-openings. It is claimed that finer control of the finished product is obtained by the short movement of the hammer and less power is required. The hammer action, directed in a horizontal plane, produces a very high percentage of cubical shaped stone particles. This crusher design can be made large enough to serve as a primary crusher and in other smaller sizes for secondary crushing purposes.

Referring to Fig. 1, it will be noticed that the anvil is suspended on a shaft mounted on the frame, and it is held against rearward movement by screws which permit adjustment of the crusher opening. The sectional end view, Fig. 2, shows how the flaring lower sidewalls of the frame permit the anvil to be widened out at the lower end. This construction at the discharge end of the crushing chamber avoids clogging and helps to increase production.

The hammer, with a hard facing plate, has rearwardly-extending-sidewalls, and it is suspended from the frame by short links near the head and longer links farther back.

The action of the hammer head moving in a horizontal plane is imparted by an eccentric cam, driven through drive wheels and a cam shaft. This cam supports a connecting rod to which are coupled toggle-links. One pair of toggle links is anchored to the frame by an anchor pin, and the other toggle links are connected to the hammer by a coupling pin so that an upward or downward movement of the connecting rod will similarly move the inner ends of the toggle links.

As shown in Fig. 1, the connecting rod is in its lower-most position so that the hammer is retired from the anvil. As the connecting rod is raised, the toggle link will be moved forward so as to force the hammer toward the anvil on a horizontal plane. Further upward movement of the connecting rod will withdraw or retire the hammer. On the downward movement of the connecting rod, the hammer will again be forced toward the anvil; thus, two blows of the hammer are made during each revolution of the cam shaft.

If a piece of tramp iron enters the crushing chamber and lodges in the upper portion, the forward movement of the upper portion of the hammer will be arrested and the pressure upon the hammer will cause it to rock slightly and compress the upper set of springs above the bearing blocks, shown in Fig. 4. The breaker will cease to function but

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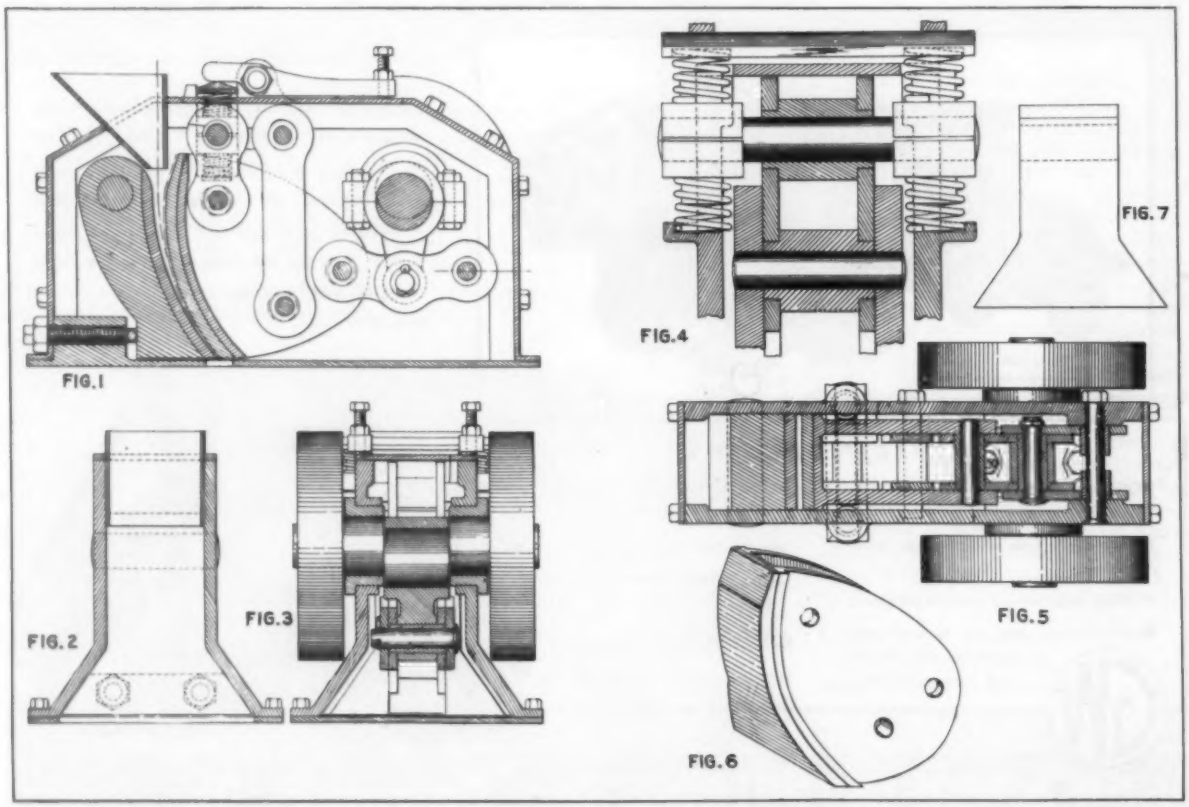
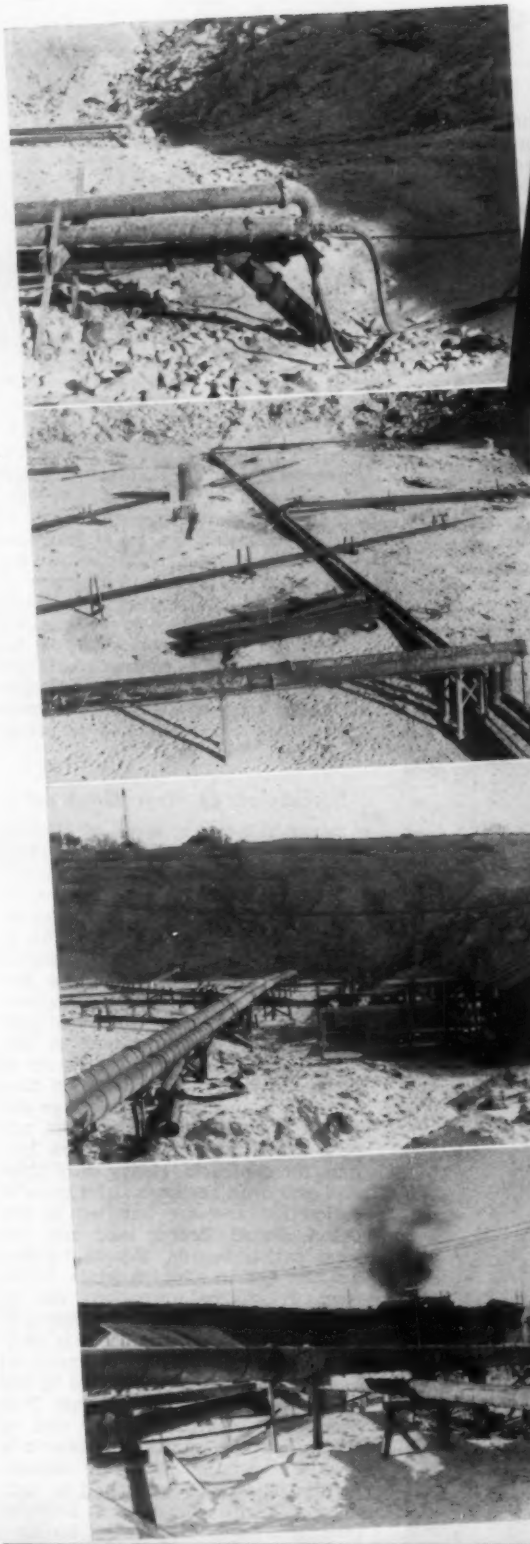


Details of crusher designed to produce cubical particles. Fig. 1: Sectional view showing anvil with adjusting screws, hammer, supporting links, cam drive and toggle links connecting to hammer. Fig. 2: End view showing crushing chamber and frame flared at bottom to accommodate anvil and hammer head widened at the discharge. Fig. 3: Illustration of cam drive. Fig. 4: Spring suspension in foreward links supporting hammer from frame. Fig. 5: View looking down into crusher. Fig. 6: Perspective view of hammer detached. Fig. 7: Face view of anvil



NAYLOR PIPE
HELPS OTTAWA SILICA MOVE MOUNTAINS

Naylor light-weight pipe is at its best on tough jobs like the Ottawa Silica Company operation at Ottawa, Illinois. The greater strength, leaktightness, safety and economy provided by Naylor's exclusive Lockseam Spiralweld structure, plus Naylor's advanced-type coupling medium, make this pipe ideal for hydraulicking and sand and gravel conveying lines.

Sizes from 4" to 30" in diameter. Thickness from 14 to 8 gauge. All types of fittings, connections and fabrication.

NAYLOR
LOCKSEAM SPIRALWELD PIPE

NAYLOR PIPE COMPANY
General Offices: 1237 E. 92ND STREET, CHICAGO 19, ILLINOIS
New York Office: 350 Madison Avenue, New York 17, N. Y.

Combined A.A.A. and Midwest Institute Meeting

PROSPECTS for a greater production of agricultural limestone in 1945 and A.A.A. contracts were discussed at a combined meeting of the A.A.A. and the Midwest Agricultural Limestone Institute held in Decatur, Ill., October 11.

Attending this meeting, for the purpose of explaining the new 1945 contracts, were representatives of the A.A.A. from Washington and the Illinois Regional Board. The producers in attendance kept these men busy answering questions and discussing the various provisions included in the County and State contracts.

Morning Session

The morning meeting, held in the A.A.A. offices of the Illinois Regional Board, was opened by Lee Gentry, chairman of the Illinois A.A.A. Mr. Gentry introduced Norbert Schwarz, administrative assistant of the Illinois A.A.A., who spoke briefly on the past production of agstone in Illinois and the hopes for larger production in 1945. He also spoke about the help that the A.A.A. has been giving the producers not only in explanation of contract questions but also in attempts to secure equipment for the producers.

GUY SMITH, assistant director of the North Central Region of the A.A.A., mentioned various troubles encountered in the old contracts and steps taken to correct them. He stressed the fact that the demand for agstone is considerably greater than the supply and that the industry has a very optimistic outlook. The new contracts for 1945 have the clause stricken out wherein the A.A.A. deals with the dealers and henceforth will negotiate directly with producers. In the new county contract, a clause has been inserted which reads in part as follows: "The contractor must look to the farmer receiving the material for the difference between the contract price and the amount stipulated as 'Net Payment to Contractor.' The Government obligation to make payment under this contract is only to the extent of the net price exclusive of the amount the contractor must collect from the farmer receiving the material." This amount to be received from the farmer will be about 30 percent of the cost. Distribution of limestone by the A.A.A. is through established trade channels wherever possible.

Prof. C. M. Linsley, University of Illinois, left, and Al Stotz having a chat

Another group at Decatur, Ill., meeting with A.A.A. officials. Left to right, may be seen John Spencer, C. A. Bernard, C. M. Linsley, Worth Merritt, N. Schwartz, and others not identified

At the Midwest Agricultural Limestone luncheon in Decatur. Facing the camera may be seen Harry Combrink, J. L. Jenkins, and W. Staffel

Discussion of New Contracts

Mr. Smith was followed by Howard Doerr of the A.A.A. who elaborated on certain clauses in the contracts for 1945. The county contract is the same as the older form, with the insertion of the "partial payment by farmer" clause. The state contract will be handled by the State Regional office which will allocate various amounts to the counties to supplement the county contracts. Mr. Doerr also spoke on the scarcity of heavy duty tires, and the fact that since tires and trucks are scarce due to the war, the length of haul will be a factor in determining low bidders for contracts. Heavy duty tires, 8.25 and over, are on a strict priority ration list and are handled by the O.P.A. Panel Boards and not the local ration boards. Trucks hauling agstone are in Class 2 while trucks used in quarry operations are in Class 3, therefore the allotment of tires to limestone producers is relatively small. Since 88 percent of heavy duty tires are absorbed by the army, the allotment to Class 3 is practically negligible. The end of the war in Europe will not materially help the situation since the concentration of supplies will then be sent to the Pacific theatre. A brighter picture is painted, however, for tires in the popular size classes such as the 7.50 size, etc., for 1945.

New trucks, heavy and light, will also be very scarce. Medium trucks, 2- and 2½-ton, will be a little more

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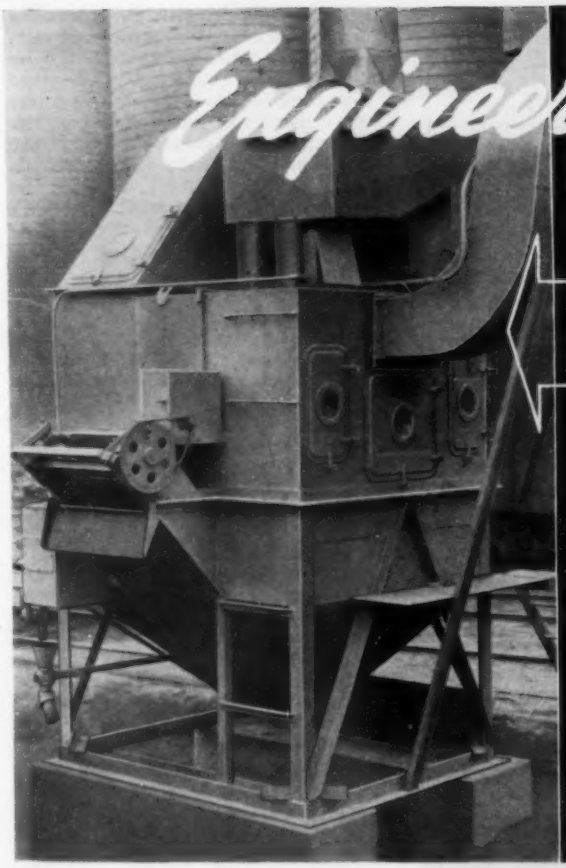

Engineered TO ROCK PRODUCTS DUST CONTROL REQUIREMENTS

TYPE N ROTO-CLONE INSTALLATION AT THE FUNKHOUSER COMPANY

This Roto-Clone exhausts 7000 cfm from a drier removing a heavy concentration of fine slate dust. This dust load with the combustion gases from the drier is handled with constant exhaust volume and high dust removing efficiency assuring cleanliness and an improved product. The Funkhouser Company is a prominent supplier of colored slate surfacing materials for roofings.

The need for adequate dust control in the war effort has resulted in the development by AAF engineers of several entirely new types of dust control equipment, among which the Type N Roto-Clone is outstanding. Originally designed for the handling of hazardous magnesium dust in aircraft engine plants, this new wet dust collector has turned out to be unusually valuable to the rock products industry for the collection of certain types of rock dusts. After being collected and wetted, the collected dust is disposed of in the form of sludge. In addition to the Type N Roto-Clone, the Type W, also a wet type precipitator and the Type D, dry type precipitator are in wide use throughout the industry. In fact, there is a Roto-Clone design available to meet every requirement of the rock products field. Write for descriptive bulletins.

AMERICAN AIR FILTER COMPANY, Inc.
Incorporated
107 Central Avenue **Louisville, Ky.**
In Canada: Darling Bros., Ltd., Montreal, P. Q.

ROTO-CLONE
FOR ROCK PRODUCT DUST CONTROL

Crushed Stone Regional Meeting in Chicago

CRUSHED STONE producers of the Midwestern Region were invited by the National Crushed Stone Association to a meeting held October 6 in the Palmer House, Chicago, Ill. Producers from Illinois, Indiana, Missouri, Iowa and Nebraska attended the meeting.

PAUL NAUMAN, regional vice-president of the National Crushed Stone Association, presided at this meeting which was called to discuss the problems of producers in this region and to learn how the association could be of service in meeting them.

A. T. GOLDBECK, Director, Bureau of Engineering of the Association, was called upon to explain the current activities of the association. Mr. Goldbeck pointed out that one of the early studies on how to properly specify stone sizes had now come to fruition in the Simplified Practice Recommendations of the National Bureau of Standards.

One of the most recent studies of the Association has been on flexible type pavements for airports and highways. The problem has involved determination of pavement thickness for given wheel loads. Mr. Goldbeck cited as an example the tremendously increased wheel load imposed by the new B-29 bomber as compared with the Flying Fortress. Static load and not impact is the main factor to consider in designing these pavements.

Another problem which has been given a great deal of study is proportioning of concrete aggregates. These studies have solved the trouble experienced with water gain.

Mr. Goldbeck also briefly reviewed the studies which the Association had made with bituminous mixtures, both hot and cold. He described the circular track which is used to test the mixes under a 2-ton wheel load. The mixtures are graded in accordance with their stability under load. The problem of stripping of asphalt from aggregates in the presence of water also has been given consideration. Mr. Goldbeck said that the use of stone sand in sheet asphalt has worked out very satisfactorily. Referring to the use of stone sand as a fine aggregate in concrete, he said that the trend is toward fines passing No. 50 mesh, finer even than natural sand, and including some dust.

Considerable experimentation is being carried on with air-entraining cements. Pavements made with air-entraining cements, he said, are more durable. Mr. Goldbeck also described how concrete made with air-entraining cement was more workable. The shape of the aggregate particle also has something to do with workability, said Mr. Goldbeck, but there is a question as to the amount of work which could be economically expended to make particles more round.

Turning to the new railroad ballast specifications, Mr. Goldbeck expressed the opinion that they are a definite improvement over the old specifications. He said that the new specifications no longer required a cementing test. The Los Angeles Rattler test is now required.

Mr. Goldbeck said that a new market is being opened up to crushed stone producers in supplying a granular material under pavements which serves as a cushion and improves drainage. He referred to articles and editorials appearing in ROCK PRODUCTS which have advocated "ballasting" highways, and said that Mr. Rockwood had been of real service to the industry in pointing out this market. Mr. Goldbeck said that granular materials had been used in the past as a cushion course, especially under macadam pavements to prevent intrusion of clay.

Another market for crushed stone pointed out by Mr. Goldbeck is the use of screenings from which dust has been removed, for bituminous concrete. A soft asphalt can be used with stone screenings because the angular shape of the particles increases stability.

Mr. Goldbeck summarized the work of the Association in compiling and publishing useful literature for the use of the members. A new series of bulletins under the general title of "Stone Briefs" will provide some very practical digests of the Association's engineering studies. The first of these is on the subject, "How to Proportion Workable Concrete for Any Desired Compressive Strength." To show the value of the proportioning studies of the Association, Mr. Goldbeck told about a railroad superintendent who had called upon him for a simple concrete specification based on concrete proportioning methods that had been set up by the Association. One study was made of airport pavements for use by a projected freight plane which involved 300,000 lb. wheel loads. Temperature stresses as well as load stresses had to be taken into consideration. A thickness of 15 in. in the concrete slab was indicated, and the Army now wants 18 in. Correct proportioning has solved the problem of pumping concrete.

Mr. Goldbeck also described briefly the course for crushed stone salesmen which was held last year. This course has proved so popular that it is expected it will be resumed this year.

(Continued on page 107)

At the speaker's table. Left to right: E. W. Baumann, Paul Nauman, J. R. Boyd, and A. T. Goldbeck

Group of those who recently attended regional meeting of the National Crushed Stone Association in Chicago. Left to right: A. T. Goldbeck, Russell Williams, S. P. Moore, and Harry Clark

A Complete Line

NATIONAL EXPLOSIVES - A COMPLETE LINE OF EXPLOSIVES FOR CEMENT, LIMESTONE, TRAP ROCK, AND THE ENTIRE NON-METALLIC INDUSTRY

THE TABLE SHOWN INDICATES THE PROPERTIES OF NATIONAL DYNAMITES, GELATINS AND FLOW-FREE POWDERS

Type	Brand	Weight Strength %	Cartridge Strength %	Av. No. 1¼"x8" Crtgs. Per 100 Lbs.	Rate of Detonation, Ft. Per Sec.	Consistency
Straight Dynamite	Straight Dynamite	15 to 60	15 to 60	208 to 220	7000 to 21000	Cohesive
Straight Gelatin	Straight Gelatin	.....	20 to 100	174 to 204	8500 to 24000*	Very Plastic
Ammonia Dynamite	Standard Dynamite	15 to 60	15 to 60	216 to 220	6500 to 13000	Cohesive
Ammonia Gelatin	Standard Gelatin	.....	30 to 80	180 to 208	8500 to 24500*	Very Plastic
High Ammonia Content, Dynamite	Dolomite 2 to 7	65	48 to 17	240 to 350	11500 to 5800	Cohesive
	Dolomite 2 9 to 6 S	65	48 to 21	240 to 330	7900 to 6500	Cohesive
Free Flowing	Flo-Free Bag 1 and 4	15 to 40	.....	8 (12½ lb.) Bag	3900 to 4800	Free-Flowing
High Ammonia Content, Dynamite	Dolomite Bag No. 5 FF	65	.....	8 (12½ lb.) Bag	5000	Free-Flowing
Semi-Gelatin	Tungite 1 and 2	65	56 and 47	220 to 240	13000	Plastic
Special Ammonia Types	Special 2A, B, D, H	61 to 65	15 to 20	290 to 340	5600 to 8950	Cohesive

*The higher rates of detonation of gelatins occur when 60% Straight Dynamite primer is used, or when charge is closely confined in bore hole.

NOTE: Straight = Nitroglycerine, Standard = Ammonia.

Millions of pounds of these Explosives are being used annually by the Non-Metallic Trade.

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NATIONAL POWDER COMPANY

ELDRED (McKean County) • **PENNSYLVANIA**

Safety

Cement and Quarry Sessions at National Safety Congress

Recent Chicago meeting attracts record attendance from the rock products industries

IN POINT of numbers, interest in the program features and general enthusiasm for safety objectives, the thirty-third annual safety congress eclipsed many, if not all of its predecessors. The same was true of the meetings pertaining especially to the rock products industries, and particularly to the sessions of the Cement and Quarry Section.

Of unusual general interest to cement and quarry people was the election of Ned H. Dearborn as president, R. J. Reigeluth, treasurer of the New Haven Trap Rock Company as chairman of the Executive Board, and A. J. R. Curtis of the Portland Cement Association as a member of the Executive Board of the National Safety Council. Mr. Reigeluth and Mr. Curtis were also members of the Council's Post-war Industrial Safety Committee.

The Cement and Quarry Section convened in the Morrison Hotel on Tuesday and Wednesday afternoons, October 3 and 4. Among those present were members of the Committee on Accident Prevention and Insurance of the Portland Cement Association who attended in a body after adjourning a meeting of that group at the Union League Club. After listening to an inspiring report by the chairman and brief reports by the committee chairman, the annual election of officers was held.

Newly elected officers of the Section for 1945 are headed by Johan Norvig, general superintendent of the Pennsylvania-Dixie Cement Corporation, who was called into service a few months ago to complete the term of David Adam, when the latter resigned as general chairman earlier in the year. After a period of 15 years as News Letter Editor, Jack Dempster, of the Canada Cement Co., had to relinquish that position a few months ago and it is being assumed by W. E. Tippin of El Paso, Texas. The completed roster of section officers follows:

New Officers

General Chairman, Johan Norvig, General Superintendent, Pennsylvania-Dixie Cement Corp., Nazareth, Penn.; Vice-Chairman, P. J. Buffington, Safety Director, New York Trap Rock Corp., New York, N. Y.; Vice-Chairman, W. V. Brumbaugh, Chief Engineer, National Lime Assn., Washington, D. C.; Secretary, J. R. Boyd, Administrative Director, National Crushed Stone Assn., Washington, D. C.; News Letter Editor, W. E. Tippin, Safety Director, Southwestern Portland Cement Co., El Paso, Texas; Chairman, Engineering Committee, H. A. Reichenbach, General Superintendent, Nazareth Cement Co., Nazareth, Penn.; Chairman, Membership Committee, F. R. Cadman, The Warner Co., Philadelphia, Penn.; Chairman, Program Committee, S. L. Greenawalt, Safety Director, North American Cement Corp., New York, N. Y.; Chairman, Statistical Committee, W. W. Adams, Supervising Statistician, U. S. Bureau of Mines, Washington, D. C.

The Executive Committee of the Section will consist of the above and the following members-at-large:

V. P. Ahearn, National Sand & Gravel Assn., Washington, D. C.; M. C. M. Pollard, National Gypsum Co., Buffalo, N. Y.; F. L. Maus, Alpha Portland Cement Co., Easton, Penn.; A. J. R. Curtis, Portland Cement Assn., Chicago, Ill.; Col. H. A. Reninger, Honorary, Allentown, Penn.; H. M. Beatty, Kelly Island Lime & Transport Co., Cleveland, Ohio; W. M. Powell, Medusa Portland Cement Co., Cleveland, Ohio; O. M. Graves, General Crushed Stone Co., Easton, Penn.; A. L. Worthen, New Haven Trap Rock Co., New Haven, Conn.; R. A. Dittmar, Universal Atlas Cement Co., Hudson, N. Y.; Wallace E. Wing, Marblehead Lime Co., Chicago, Ill.

TABLE 1—ACCIDENT-FREQUENCY RATES PER MILLION MAN-HOURS OF EMPLOYMENT (KILLED AND INJURED), 1942-1943, BY KIND OF QUARRY

(All 1943 Figures Are Preliminary)

Kind of Quarry	1942	1943	Points Change in 1943 Increase	Decrease
Cement rock*	11.72	13.34	1.62	...
Granite	43.51	42.46	...	1.05
Limestone	49.56	43.62	...	5.94
Limestone (chief product, lime)	52.82	50.88	...	1.94
Marble	39.00	37.04	...	1.96
Sandstone	59.68	57.63	...	2.05
Slate	74.89	50.07	...	24.82
Trap rock	60.32	59.91	...	.41
Total	35.73	33.98	...	4.89

*Includes limestone or other stone used in the manufacture of cement.

Johan Norvig, re-elected general chairman, Cement and Quarry Section, National Safety Congress

Accident Analysis

The Tuesday afternoon session was opened with a paper by W. W. ADAMS, supervising statistician of the U. S. Bureau of Mines, entitled "An Analysis of Cement and Quarry Accident Experience." This paper gave statistics of the percentage of accidents occuring in 1943 as compared to 1942 in the various branches of the rock products industry. Table 1, herewith, gives the comparative figures of accident-frequency in the various branches of the industry.

R. A. BECHTOLD, superintendent of the Pennsylvania-Dixie Cement Corp., Des Moines, Iowa, read a paper entitled "An Analysis of Quarry Hazards." In this paper, Mr. Bechtold gave figures showing the number of accidents occurring in quarries and mines. He gave concrete examples of accidents that have occurred at his plant showing reasons why they happened and the preventative measures to be taken to prevent their reoccurrence. War is partly responsible for the increase in the accident rate, he said, since a greater labor turnover results, tending to the use of younger than usual employees, more old and handicapped employees, and less experienced employees. This naturally places a greater load on the superintendents and foremen whose job is to teach safety. There are still a great number of accidents to employees who have been in service for a number of years, he said, partly due to carelessness. Consequently, a job is still to be done to promote safety.

(Continued on page 111)

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Cement for Calais...

Chemicals for China...Foodstuffs against "Festung Europa"

MUCH of what it takes to fight a war—and to feed the fighting, liberated and home fronts . . . travels today in tough kraft shipping sacks . . . paper sacks that are dust- dirt- vermin- and moisture-proof.

Multiwalls stand up under the most rugged handling and neither salt water nor sun nor rain nor heat nor cold nor gas nor smoke impairs their efficiency. Multiwalls store and stack easily and losses through spoilage, sifting and infestation are infinitesimal.

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Ready Mix for Farmers

(Continued from page 78)

trucking company is now the principal customer of the sand and gravel company.

The transit mixers take their materials and water under the loading bins of the sand and gravel company. The mixers are operated as agitators until within a short distance of the job. Then the water is turned in and the mixing rotation is begun.

There are nine Jaeger mixer trucks. Three are on Ford chassis, one 2-cu. yd. high dump and two 1½-cu. yd. low dump; six are on General Motors chassis, two 2½-cu. yd. high dump two 2-cu. yd. high dump and two 2-cu. yd. low dump. In addition the company operates seven 1½-ton dump trucks, six Fords and one General Motors.

The principals of the company are F. W. Sloter, W. W. Sloter and W. C. Bennett.

New Crusher

(Continued from page 80)

the link motion will continue without damage. If the piece of tramp iron should lodge below the central line of thrust, it will compress the springs below the bearing blocks. The tension of the springs is relatively light and has no effect on the hammer except in the case of the lodgment of tramp iron. When it is observed that tramp iron has entered and that regular crushed material is no longer passing through the discharge opening, the power may be turned off and the adjusting screws at the back of the anvil may then be used to release the iron or steel. The anvil may be easily removed for repairs or a change of wearing plates as it is suspended at its upper end by a shaft.

Due to the equal action of the hammer at the feed and discharge openings, the throw or movement of the hammer is reduced to a minimum at all points of its breaking or crushing surface, therefore, its breaking action on material, being equal at all points on its face, makes it an effective breaker of cubical particles.

Agstone Is Scarce

THE MONTGOMERY COUNTY (Kansas) A.A.A. Committee has been forced to change the method of handling the distribution of agricultural limestone through the Soil Conservation Program. Agricultural limestone is not available at the Universal Atlas Cement Co. plant at Independence, Kans., and all agstone that is delivered must be shipped in from Moline, Kans. This has increased the cost considerably to the farmer for additional shipping charges.

Write for your copy of the CATALOG

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NOVEMBER 1944

ROCK PRODUCTS'

CONCRETE PRODUCTS AND CEMENT PRODUCTS

• Concrete pavements and interconnecting driveways between stockpiles facilitate handling of block from plant to yard and haulage by truck at Potter Coal and Material Co. plant in Indianapolis, Ind.

SIX REASONS FOR BUYING A STEARNS CLIPPER STRIPPER

1. **Produces more blocks** per man per day than any other machine with comparable power operations —100 to 240 blocks per hour.
2. **Four separate models** with power tampers ranging from manual feeding and stripping to all-power.
3. **It's Adaptable:** Interchangeable parts permit progressive addition of power equipment **without sacrifice.**
4. **Low first cost—low maintenance cost.**
5. **Outstanding simplicity and efficiency.**
6. **Cored pallets** with all their advantages.

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Write today for new Clipper folder describing all four models and attachments.

Clipper Stripper Model A (All-power)

Performance **Speaks Louder than Words**

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1 Clipper Stripper

ASK any STEARNS owner.

STEARNS MANUFACTURING CO. - ADRIAN, MICH.

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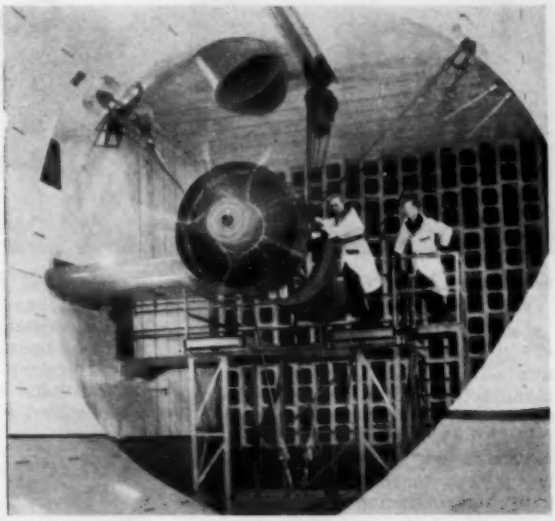
Also manufacturers of Jeltcrete Block Machines licensed under the basic Gelbman Vibration Patents, Mixers, Skip Loaders

Use Acoustical Block for Engine Test Cells

Homestead Company and Industrial Sound Control, Hartford, Conn., makes special concrete unit for engine test cells



Testing airplanes in sound-absorbing cell

A CONCRETE PRODUCT that has not been given much publicity is a special machine-made concrete block used to deaden sound. This acoustical unit is miscalled cast stone, and has a number of trademark names, one of which is "Soundstone."

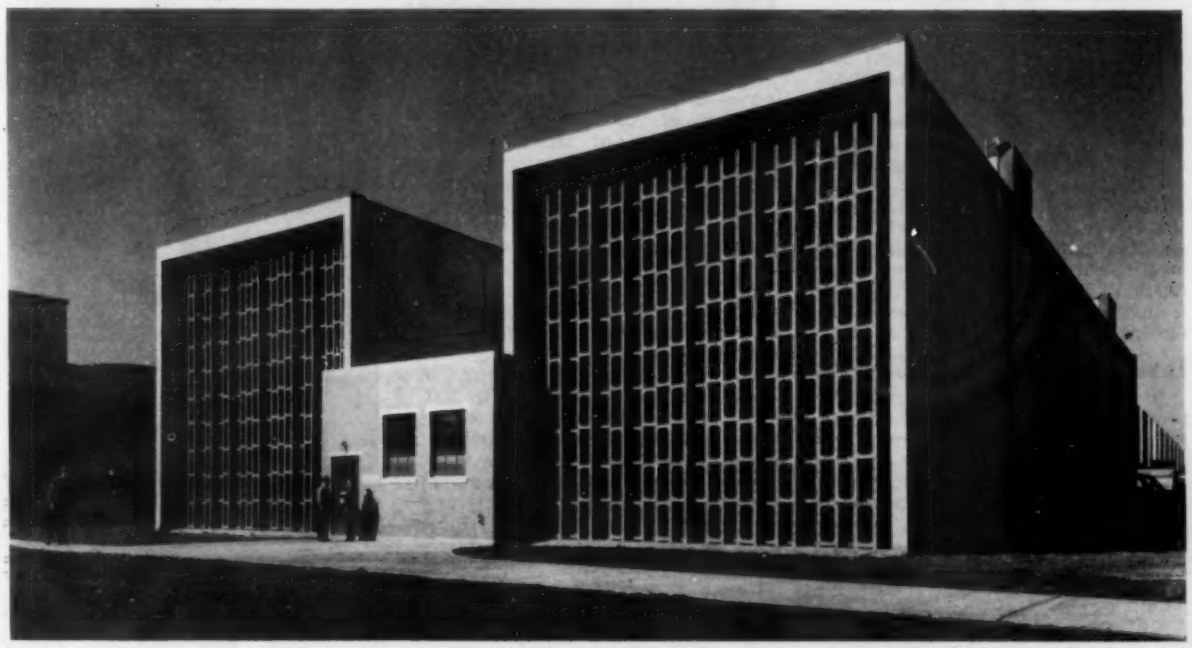
Soundstone and its competing units were developed principally to reduce and eliminate noises that were produced when testing airplane motors. Such motors must be tested at the factory, and again after being overhauled, following a certain number of hours of operation, and such tests require that the motor be kept running for from eight to ten hours at various speeds. This noise was of considerable annoyance to factory employes, at Army and Navy Posts where men in the service were quartered, interfering with their rest, and to residents living at some distance from the testing buildings.

A motor test building or cell is now built in three sections, a test room and two acoustic (or sound absorbing) cells. The acoustic cells are generally placed at each end of the test room and form either a horizontal or U-shaped tunnel that will provide an ample flow of air to cool the air cooled motors being tested. These cells are about 20 ft. square, although some have been built that are nearly 40 ft. square. Within the walls of the acoustic cells the soundstone units are set up to form a series of broken ribbon walls that are parallel to the sides, top and bottom, which remind one of a giant honeycomb.

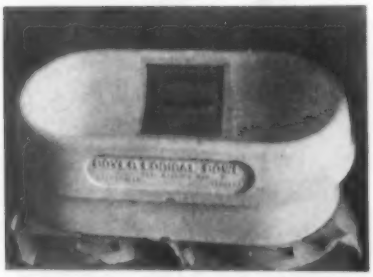
Manufacture

Soundstone units were required to have a sound absorption coefficient of .75 as an average for 128 cycles, 256 cycles, and 512 cycles. This required a light-weight aggregate which

(Continued on page 100)



Exterior view of two airplane engine test cell units. Note special concrete sound-absorbing units



Smooth, dense finish is required for hog trough

Concrete Hog Troughs

J. C. Boyer Co., Greenfield, Ind., also manufactures concrete fence posts, colored flagstone, and concrete practice bombs

By H. E. SWANSON

AN UNUSUALLY SMOOTH FINISH, closely resembling marble, has been attained on the concrete products manufactured by the J. C. Boyer Co., Greenfield, Ind. Originally concentrating on production of the "Boyer Logical Bowl," a trademarked feeding trough for livestock, this company has conducted experiments recently which will lead to the production of other concrete products. These will include concrete fence posts, colored flagstones, and concrete practice bombs for the War Department.

Prior to 1936, when this company was started, Mr. Boyer began experimenting with a practical type of livestock feeding bowl which would eliminate the troubles encountered with the old style metal troughs. He had plenty of opportunity to witness the results of his experiments on his own farm, and as a result, finally evolved the present style of hog feeding trough, upon which he applied for a patent. This trough, which he named the "Boyer Logical Bowl," because he felt that it was the most logical shape, size, and weight for the purpose for which it was made, has many advantages over the metal troughs used. It cannot be overturned, is easier to clean, is more sanitary, cannot be bent out of shape as the metal ones are, and is not affected by cold or frost. Realizing that there should be a market for such a product, which would be a boon to the farmers, he started production of this type of feeding trough at his present location in Greenfield, Ind.

Laboratory Control of Concrete

In attempting to make a superior product, he enlisted the aid of the Pittsburgh Testing Laboratory in Indianapolis to determine the proper grading of aggregates and the proportions required to secure an optimum strength with a smooth surface. Tests were also made to obtain strengths comparable to those in high grade cast stone. The Portland Cement Association was also contacted for information and assistance. Contact with these two agencies has been maintained through the eight years that this company has been in operation to keep a constant check on the manufacturing operations to insure a high grade product.

Clean sand and gravel aggregates are specified and received from one

Typical advertising of hog troughs

source in order to keep a material on hand of consistent quality. Accurate weights of all ingredients, thorough vibration, smooth cast iron and pressed steel molds, and proper curing are reasons for the smoothly finished product and for the high strength achieved. The aggregates used are thoroughly washed gravel, sized from ⅝-in. to ¼-in. mortar sand, and high early strength portland cement. Water is weighed for each batch and the weight adjusted according to the moisture content in the aggregates as determined by test. After mixing, the concrete is deposited into molds which are clamped on a vibrating table. This table, designed by Mr. Boyer, is powered by a Syntron electric controller vibrator, which produces 3600 vibrations per minute. Plates for different forms can be attached to this table which is shown in the accompanying illustration. The cast iron and pressed steel molds used are coated with a form oil before introduction of the concrete, which is another important factor in acquiring a smooth finish.

Curing for High Strength

The concrete product is left in the mold overnight. The next morning it is removed and placed on metal racks for transference to the curing rooms, of which this company has three. Racks, having a capacity of 16 bowls, are moved to the curing rooms by lift truck where the bowls are cured for a period ranging from 24 to 26 hours. Each room has a capacity of six racks.

Steam is introduced to the rooms through a ½-in. pipe from a Pacific steel heating boiler which has a McDonnell boiler water control and a Minneapolis-Honeywell pressuretrol. The steam pressure is kept at 15 p.s.i. and a temperature of about 110 deg. is maintained throughout the curing period.

Upon removal from the curing rooms, the bowls are of sufficient strength that they could be shipped immediately. A 10-day old bowl has a compressive strength of 3900 to 5400 p.s.i. They weigh about 61 lb. each and are 27 in. long, 18 in. wide, and 6 in. deep. Production capacity, using a single vibrating table holding two racks, is 100 per day.

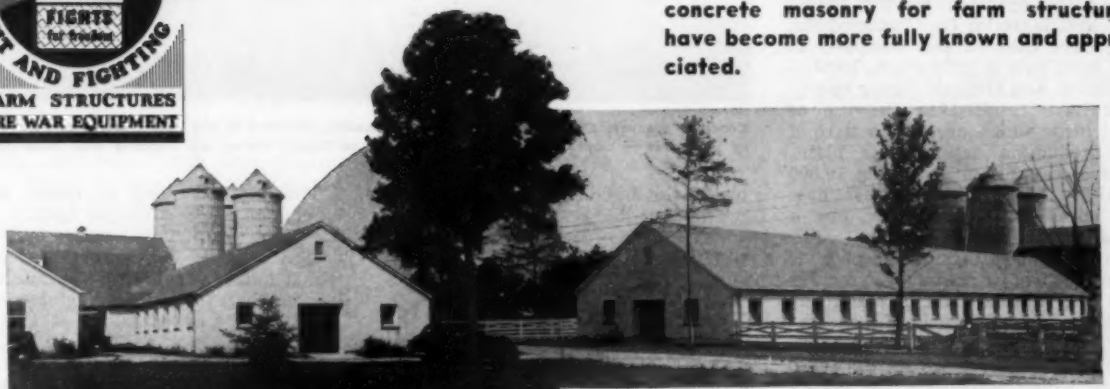
Up to the present time, this com-

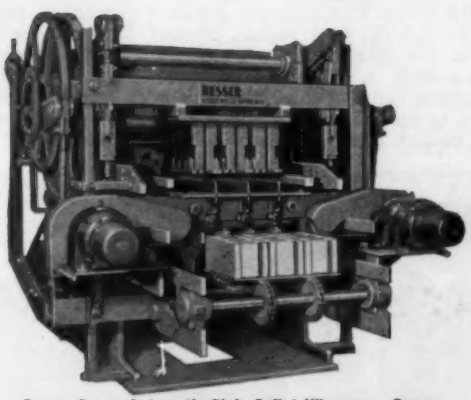
(Continued on page 100)

Special vibrating table developed to remove voids in concrete

Concrete Masonry Units Plentiful for Farm Structures

During the past three seasons farm building construction has provided a big market for many concrete masonry manufacturers. This market will grow faster now that the availability and advantages of concrete masonry for farm structures have become more fully known and appreciated.





Besser Super Automatic Plain Pallet Vibrapac. Capacity 600 8"x8"x16" per hour made 3 at a time on one plain pallet. Smaller units made in larger multiples on the same pallets.

Why concrete masonry units are Better for all Farm Buildings — use not restricted—low cost — firesafe—permanent-weatherproof—better sanitation—rodent and vermin proof—freedom from "repairs."

Important Patent Notice

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The Vibrapac combines vibration with exclusive patented Besser Plain Pallet principle.

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Complete Equipment for Concrete Products Plants

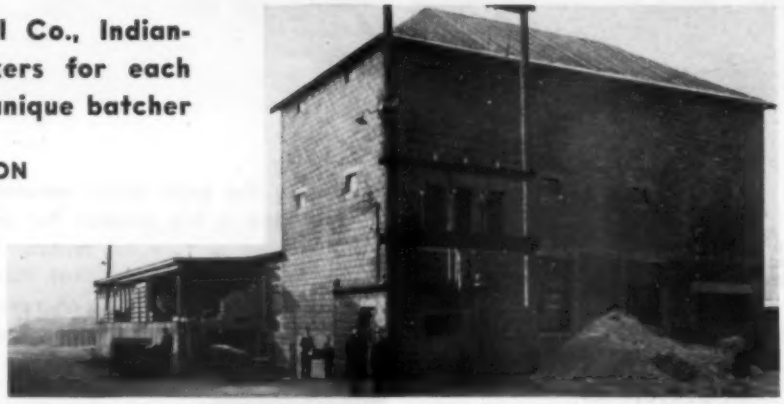
THE SAVING IN PALLET COST WILL PAY FOR A BESSER VIBRAPAC PLAIN PALLET STRIPPER

Material Handling

Cutting Down Production Costs

Potter Coal and Material Co., Indianapolis, Ind., has two mixers for each block machine. Develops unique batcher

By H. E. SWANSON



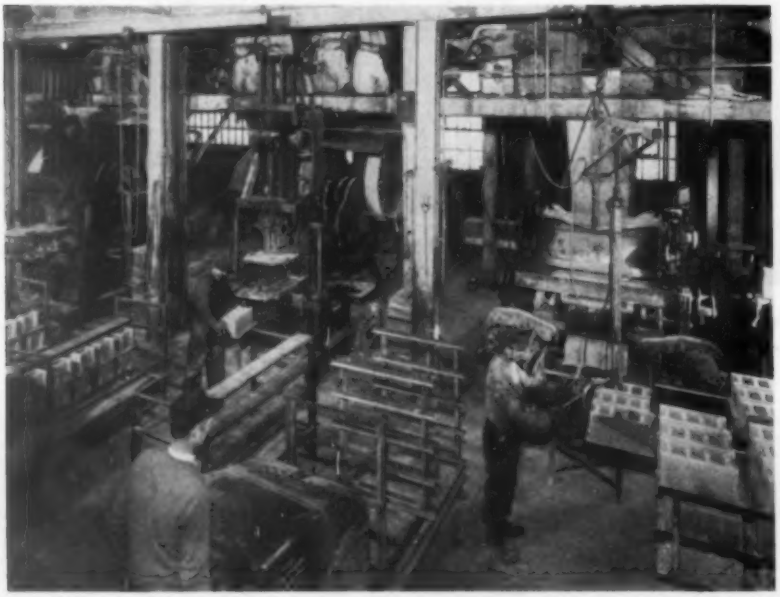
Concrete products plant with convenient truck loading platform to the left. Pallet conveyor may be seen next to empty rack. J. LeRoy Potter and Robert Potter are standing near office door

INTRODUCTION of several time and labor saving devices into the working operations of the concrete products plant operated by the Potter Coal and Material Co., Indianapolis, Ind., have enabled this company to take short cuts in production. Experimentation and analysis during operations have resulted in the use of novel ideas which are now a part of the production setup. This plant, which is capable of producing 10,000 to 11,000 standard block per day, uses three Besser machines, one a Vibrapac and two tampers.

An unusual feature of the plant is the method of reclaiming aggregates from the railroad cars. A track unloading device, shown in the accompanying illustration, employs a chain driven conveyor, equipped with paddle flights, which transports the aggregates from a hopper under the cars into the plant. This conveyor is powered by a 5-hp. G.E. motor. Shown also in the illustration is a winch, using a 30-ft. length of ¾-in. cable for moving railroad cars. This winch uses a 10-hp. G.E. motor for power. Both motors mentioned are located inside the building, and in the case of the winch, a shaft through the wall connects the motor with the winch.

Novel Batching Equipment

Aggregates are delivered by the paddle flight conveyor to a bucket elevator, 60 ft. high, which is powered by a 10-hp. G.E. motor. This elevator discharges into either of four 60-ton capacity hopper bins, located above a one-sack capacity batcher, which operates on a tram rail. The batcher serves all four of the bins and discharges into either of the mixers serving the three block machines.



Battery of block machines. Note the two mixers for each block machine on mezzanine floor above

The method used to dump the batcher is another unique feature of the plant setup. This batcher is supported on an off-center fulcrum, which makes the top of the batcher heavier than the bottom when loaded. Release by a lever allows it to tip over and deposit its load into the mixer. When empty, the batcher returns to an upright position, since it is now heavier on the bottom due to the off-center fulcrum. Batches are measured by volume.

Cement received in sacks is delivered to the storage room on the second floor of the building by a prong elevator, powered by a 3-hp. G.E. motor. Cement is added to the mixer manually. A double mixer system is used for each block machine, one mixer being ready for charging while the other is mixing. This method insures constant operation of the machines, no time being lost in waiting for a batch to be mixed. Water, received from the city water supply, is measured by an automatic batcher which employs the float principle for automatic shutoff.

Block are removed from the two tamper machines manually, while the Vibrapac is equipped with a pneumatic off bearer. They are placed on 60-pallet racks and sent to the curing rooms. Two Clark lift trucks are used for transportation to and from the curing rooms. Four curing rooms are used, each being 6- x 14- x 100-ft. in size, and having a total capacity of 3000 standard block. The curing rooms are entirely within the main building, and are constructed with concrete block side walls and poured concrete floors and roof. The room directly above the curing rooms is used both as a storage room and for manufacture of lintels and joists. Having the curing rooms entirely en-

closed in the building has its own advantage in that it prevents condensation which would occur were the rooms located outside.

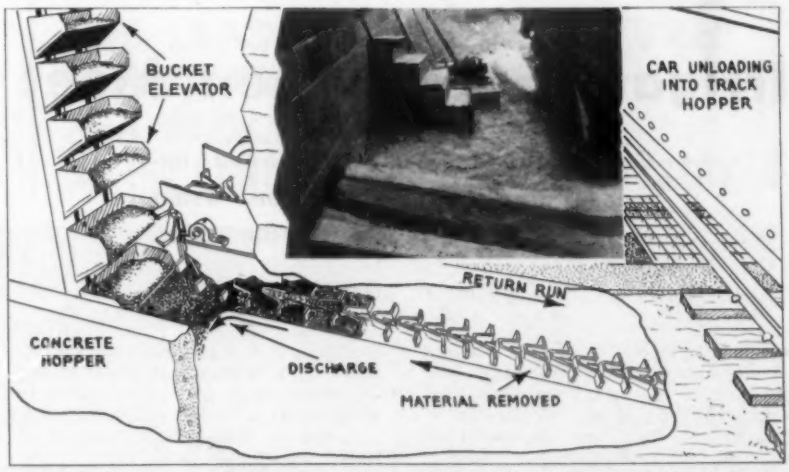
Opposite the delivery end of the curing rooms a tunnel or breeching has been constructed which allows the dissipation of steam during the period when the units are being discharged. This is another feature of the plant which is not extensively employed in the majority of block plants. This tunnel, built at right angles to the curing rooms and extending across the back of all four rooms, is 2 ft. wide, 6 ft. high, and 60 ft. long and has openings into each of the rooms. An American blower fan, operated by a 10-hp. G.E. motor, located at one end of the tunnel, draws off the steam from the curing rooms and discharges it to the outside of the building. This prevents the steam from escaping into the room where the units are made, thus creating more comfortable working conditions in the main plant.

Steam is introduced into the curing rooms through two ¾-in. pipes for each room. An Erie City Ironworks tubular 150-hp. boiler provides steam for curing. Dry heat is also used, being introduced through two 1¼-in. radiator pipes. A temperature of about 130 deg. is maintained during the 12-hr. curing period.

After curing, the block are removed to the storage yard by the lift trucks. This yard can accommodate about 1,500,000 block.

Roller Conveyor for Pallets

Still another innovation in the operating procedure of this plant is the method of returning pallets from the outside into the building. A pallet dock, about 20 ft. in length, shown in the illustration, equipped with rollers, allows empty pallets to be returned into the main plant at the rear of the block machines. The rollers are set at a slight angle inclining into the building, which permits the pallets to be sent in through a small opening in the wall, with a minimum of effort. A flap inside the building closes after passage of the pallets, thus keeping the opening closed when pallets are not being sent in. This method of transfer obviates the necessity of opening the doors of the building when pallets are returned, thus permitting more comfortable operation in the main plant in cold weather operation.



Paddle flight conveyor transports aggregates from cars to bucket elevator inside plant. Car moving winch may be seen in background above

Pallet dock where roller conveyor moves empty pallets into block manufacturing department

In addition to sand and gravel concrete units, this company also produces Celocrete units, lintels, joists, ornamental units, septic tanks, and brick. Capacity for concrete brick is 40,000 per day.

J. Leroy Potter and Robert F. Potter are the owners of the Potter Coal and Material Co., and in addition to their masonry unit plant also sell coal and building materials.

Tilting batcher at left travels on tram rail to charge mixers over each block machine

Making Big Pipe

A. J. McMillan Co., operating concrete products plants in Seattle and Renton, Wash., is busy making pipe for Boeing Field. A Teurck-McKenzie double-tamper, pipe machine was recently installed in the Seattle plant which was the former plant of Atlas Concrete Products Co. This machine has a capacity up to 42-in. pipe. The Renton plant is equipped to make up to 18-in. pipe on a Teurck-McKenzie machine. The company also is making cast concrete 48-in. pipe for Boeing field.

Pavement Yardage

Awards of concrete pavement for September, 1944, have been announced by the Portland Cement Association as follows:

	Square Yards Awarded During September, 1944
Roads	1,186,155
Streets and Alleys	564,008
Airports	962,115
Total	2,712,278

Irrigation Pipe Men Meet

California manufacturers have immense market for irrigation. Using more machinery to handle pipe

By M. W. LOVING*

THIRTY-NINE active and 31 affiliate members and guests attended the meeting of the California Associated Concrete Pipe Manufacturers at Bakersfield, Calif., on September 29 and 30. All discussion of problems and other aspects of the concrete irrigation pipe industry was led by Harold W. Chutter, president of the association. Each of the three sessions were well attended and everyone was seriously concerned with, and interested in the proceedings. While a number of the 50 members of the Association are engaged in the manufacture and sale of concrete sewer pipe, reinforced concrete sewer and culvert pipe, practically all of the discussion centered around the concrete irrigation pipe industry.

Today, as in the past 60 or more years, concrete irrigation pipe is playing a major role in the agricultural and commercial development of California. All citrous fruit—oranges, lemons and grapefruit grown in California depend on heavy and frequent irrigation, without which the lands would revert to the deserts from which they were reclaimed. The same applies to deciduous fruit such as prunes, apples and peaches. On one ranch near Marysville, Calif., for example, to my personal knowledge, about 30 tons of choice peaches are grown on each acre. The ranch is irrigated with a concrete pipe system installed in 1925-1929, consisting of 15,000 ft. of 10- and 12-in. pipe. Water for irrigation is secured from four wells located on the ranch and the system operates under a maximum head of 24 ft. Before irrigation, this ranch had a potential value of $150 to $200 per acre. Today it could not be purchased for $2000 per acre. During dry years, 2½ to 3 acre feet of water is required and in wet years this may be reduced to only 1½ acre feet.

*Consulting engineer.

Elmer Johnson

Fred Spolkerman

Concrete Irrigation Pipe Essential to California Fruit Industry

Walnuts, grapes, flax, cotton (of exceptionally fine quality), alfalfa and vegetables of all kinds are grown on lands irrigated with concrete pipe irrigation systems, winter and summer. Of 21 million irrigated acres in the United States, California has more than 5 million acres, mostly under intense cultivation. A conservative estimate of the quantity of concrete pipe used to construct irrigation systems in California in the past 60 or more years, is more than 30,000 miles—the largest in any state.

The chief engineer of one of the large ranches in Southern California (embracing 107,000 acres — mostly under intense cultivation) told me on October 5, 1944, that about 225 miles of concrete irrigation pipe lines have been installed on this ranch since 1905. Many of the orange groves on this property cannot be purchased today for $4000 per acre for the obvious reason that the annual yield per acre today is about $1,000. This visit was to me of unusual interest, both from the standpoint of concrete and concrete pipe, as well as from an agricultural angle (my garden at Glenview, Illinois, is 25x50 ft.). The chief engineer drove us near the top of a hill to show us a slide near an old earthquake fault. He showed us how the contour method is employed in irrigating hilly land and said that on this acreage last year the tenant took off winter tomatoes worth $550 per acre.

Reverting to the Bakersfield, Calif.,

(Continued on page 98)

Harold W. Chutter, President

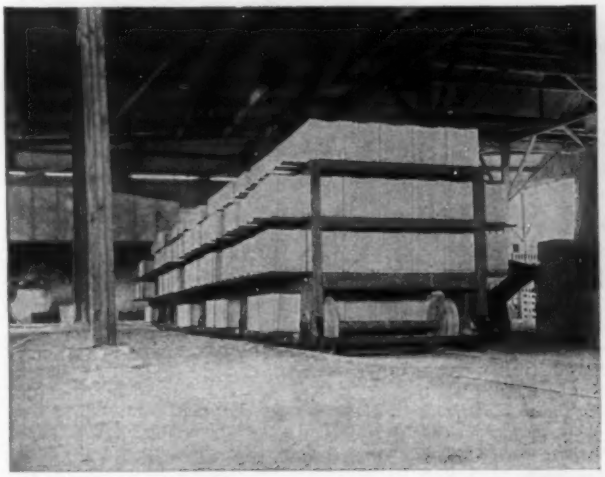
H. A. Wiegand

For 35 Years...

THE LEADING MANUFACTURER of LIFT TRUCK RACKS and BLOCK CARS for the CONCRETE PRODUCTS INDUSTRY

● Style 293 Hinged Deck Block Cars in service at the Edmonds Art Stone Company, Washington, D. C.

● Style 294 Hinged Deck Lift Truck Racks in block plant of Cleveland Builders Supply Co., Cleveland, Ohio.



● Style 198 Block Cars for high pressure steam curing at L. G. Randolph Concrete Products Co., Ann Arbor, Michigan.

● Style 2167 Lift Truck Racks with steel decks in the block plant of the Currier Lumber Co., Detroit, Michigan.

ANY STYLE OR DESIGN LIFT TRUCK RACK OR CAR FOR YOUR PLANT

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Mr. and Mrs. Gordon W. Williamson

meeting, the War Manpower Commission, San Francisco, Calif., on December 28, 1943, declared that concrete pipe manufacture throughout central and northern California was a "locally needed" industry. Prior to that action, the W.M.C. had declared "installation of irrigation pipe systems" as an "essential industry" but the "manufacture of concrete irrigation pipe was non-essential." Mr. Chutter, H. A. Weigand, San Jose, and others worked like beavers to bring about the change in this mixup because it was obviously impossible to install irrigation pipe systems without concrete pipe. Members of the Association and others filled out detailed questionnaires required by the War Manpower Commission which was presented to that agency by Messrs. Chutter and Weigand, and together with the help of the larger ranchers and their organizations, including the Farm Production Council at Berkeley, Calif., the situation was finally adjusted. This is one of the many examples of cooperative action at its best, and those attending the Bakersfield meeting were highly appreciative of the fine and very effective work Mr. Chutter had done for the Association and the concrete irrigation pipe industry in California.

Today about 80 firms operating 107 plants or "pipe yards" are engaged in the manufacture, sale and installation of concrete irrigation pipe in California. Fifty firms operating 60 yards are members of the California Associated Concrete Pipe Manufacturers, Fresno, Calif.—organized in 1919. Practically all of these firms operate on a rather modest scale because prevailing prices for concrete irrigation pipe are, and always have been, low. Systems built with it replace open ditches, the initial cost of which are not high but the maintenance costs are excessive. With the present shortage of labor, practically every rancher wants to install a concrete irrigation pipe system. Besides, in the open ditch, water losses are severe and one section of a ranch may be over-irrigated and ruined with a given and limited amount of water while the rest of the acreage is left high and dry.

Thus, a properly installed concrete irrigation pipe system fitted with the necessary appliances — metal gates and valves, is a distinct and almost indispensable asset to any California ranch, large or small. As above stated, this is particularly true now with the prevailing labor shortage and the great demand, and, incidentally, high prices for crops of all kinds. Mr. Chutter said that on one ranch a twelve-year-old boy took care of the concrete irrigation pipe system. With open ditches, several men would have been required for operation and especially maintenance.

Practically all concrete pipe irrigation systems operate under low head, up to 30 ft. or more. The pipe is not reinforced with steel except under certain conditions and even then the pipe is only provided with one or two steel rip rings. Because the hydrostatic pressure, including water hammer (shock) is usually controlled by vertical structures, also made of plain concrete pipe, the steel rip rings and other steel reinforcement are not often used because the ranch owner is seldom willing to pay for this special construction. Thus, by force of necessity the California concrete irrigation pipe manufacturer has become, or rather, always has been, a leading, practical concrete expert. Besides, he knows practical hydraulics from A to Z. Today, as in the past, those engaged in this business (1) make concrete pipe; (2) build the pipe lines, including installation of gates, valves and all necessary vertical structures, make the joints right and tight, and (3) guarantee the system against leakage for one year. This has in reality become to mean an indefinite period because to survive, the concrete irrigation pipe manufacturer has to "live with" his customers and unless he meets the conditions just mentioned, he soon fades out of the picture. The uninitiated would naturally conclude that the boys in this business are college graduates and specialists in concrete research and

To meet the labor shortage in California women are employed in pipe plants. Note young lady operating off-bearer machine

Two views of hydraulic, fork-type lift truck to handle pipe to stockpile and to load trucks

John Kristich

hydraulics. You will be surprised to know that some of the best in the business cannot read a set of plans or specifications but they "know how."

Value of Practical Experience

Take one typical example—John Kristich (Kristich Bros.—John and Nick). On his business card the following is listed: "Machine made concrete irrigation pipe systems. Anything made from concrete." John, whose picture is shown, was born in Herceavina, Austria, in 1889 and came to Los Angeles, Calif., in 1907. His first job was washing dishes in a local restaurant. Two years later at the tender age of 15 he got a job with the late Arthur Bent as a "pipe stomper." Mr. Bent of the famous contracting firm bearing his name, was at one time president of the Associated General Contractors of America and his firm was the builder of many large and expensive concrete dams, the most recent being Friant Dam of the great Central Valley Project in California. Mr. Bent was one of the early manufacturers of concrete irrigation pipe in California.

In those days, all concrete irrigation pipe was hand made in 2-ft. lengths by tamping concrete of semi-dry consistency in steel forms. An outfit for producing any diameter pipe consisted of one steel core, two steel jackets and one or more steel top rings (for forming the joint, manually), and a hundred or more base rings. A crew consisted of two men and one helper — usually a water boy, who kept the pipe constantly wet by hand sprinkling. The work accomplished by modern pipe machines today was then done by hand. Thus the man who did that kind of work for ten hours day in and day out in the hot desert sun, had to be rugged indeed. I am reliably informed that concrete pipe made then by the leading producers was comparable in quality to that made by machine today. It must have been, because this pipe is in service now and the systems do not leak.

In the manufacture of concrete pipe with semi-dry concrete mixtures, sufficient water must be used in the mix to assure proper hydration of the cement. Distinct web-like markings should appear on the exterior surface of the pipe which indicate that the proper amount of water has been used in the concrete mixture. Workmen obviously prefer to make "dry mix" pipe because the jackets are easily stripped with less injury to the green concrete. Mr. Arthur Bent was among the first to require his men to make concrete irrigation pipe of excellent quality long before this kind of pipe was made by machine. Tom Polich one of three partners of a very large contracting firm in Los Angeles told me in Los Angeles on October 9, 1944, about his first job in 1907 with Mr. Bent. Tom said he and his partner often hand-tamped 100 joints of 2-ft. long concrete irrigation pipe in 10 hours under a broiling desert sun, and the quality of the pipe was comparable with that made today by high production machinery. Obviously, all of the concrete irrigation pipe made in those days and even now, is not of excellent quality but all in all, it is the exception rather than the rule to see concrete irrigation pipe of inferior quality made in California.

The precise technique of making joints with portland cement mortar was also developed in the early days. Each joint was then, and is today, immediately covered with damp earth to assure proper curing and above all, to avoid shrinkage cracks. This came about by force of necessity because, as previously stated, the manufacturer has to replace defective pipe or repair joints at his own expense.

John Kristich engaged in the manufacture of concrete pipe on his own in King City, Calif., in 1919 and later branched out at Comphora and Watsonville. Because he made concrete irrigation pipe of excellent quality, laid it properly with tight joints made with portland cement mortar, and guaranteed his work for one year and more, he established his reputation. In October, 1936, the owner of a large ranch near Soledad, Calif., decided to develop 3000 acres for growing almonds. Beans were to be grown on this ranch, too, until the almond trees matured. He engaged an engineer who laid out a system requiring 103,000 ft. of 10-, 12-, 14- and 16-in. concrete irrigation pipe. The 10- and 12-in. pipe had a shell thickness of 1¼ in. and the 14-in. pipe, 1⅜ in., and the lines built with it were to operate under static heads from 30 to 40 ft. The 16-in. pipe with a shell thickness of 2½ in. required for a 30,000-ft. force

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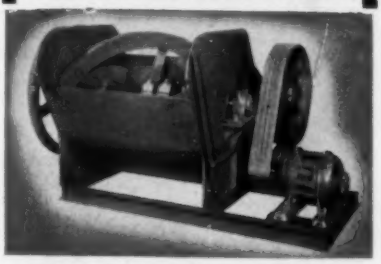

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Equipment for all phases of manufacturing concrete cinder block and other lightweight aggregate units. Our engineering service for new plants and modernizing old ones will help you operate more economically.

Hobbs block machines, Anchor tampers, Anchor Jr. strippers, Stearns power strippers, Stearns Joltcrete, Stearns mixers, pallets, Straubiox Oscillating attachments, etc.

Repair parts for Anchor, Ideal, Universal, Stearns, Blystone mixers and others.

Anchor Concrete Mchy. Co.
1191 Fairview Ave., Columbus 8, Ohio

main was required to operate under a static head ranging from 150 to 250 ft.

John borrowed $150,000 from a local bank and bid on the job but he could not understand the plans and specifications. Yet he knew from practical experience that he could build the system and deliver the required amount of water from wells located on the tract to the points designated by the engineer. The total contract price was $210,000 and the bank and the ranch owner required no bond because they had faith in John Kristich. He completed the system April 15, 1937, when it was tested in service. Prior to this date he had received no money and when he received his first payment he endorsed it over to the bank. The balance of the contract price was paid to Mr. Kristich on May 1, 1937.

Remember he was solely responsible for the manufacture of the pipe, installation of pipe lines including making joints, installing appliances and vertical structures, etc. He engaged a steel manufacturer in San Francisco to make up spiral wound steel cages for the 16-in. force main. Spacing of the circumferential 1¼-in. wire was 2-in., center to center, for the high head and about 4-in., center to center, for the 150-ft. head. The pipe were machine made in 3-ft. lengths and the steel cage was placed near the outer surface in a concentric position. Because the temperature of the ground water used for irrigation was constant throughout the year (about 70 deg. F.) joints were made and banded with portland cement mortar. Every joint, like the pipe, was carefully cured. They were made by men experienced in that delicate and most important task. After seven years of continuous service, the system just described has developed no leaks, thus John Kristich has not been required to make any repairs the first year or thereafter.

Making good concrete, concrete pipe or any precast concrete product depends (1) on experience; (2) common sense; (3) education. The same applies to hydraulics or any branch of civil engineering.

Engine Test Cells

(Continued from page 91)

would pass the No. 8 sieve and be retained on the No. 16 sieve. The units range in size from 4- x 9- x 24-in. to 9- x 35- x 42-in. and are made on a special machine. Each unit is required to withstand a compressive stress of about 1000 p.s.i. and must withstand freezing and thawing tests for 60 cycles, as they must be unaffected by 100 mile winds, year round weather, vibration, oil, grease, steam and hot water.

This unit was developed by the Homestead Company & Industrial Sound Control at Hartford, Conn., and they have proven to be leaders in this field. Some of their installations of the last eight years are at the following plants: Wright Aeronautical Corp., Pratt & Whitney Aircraft, East Hartford, Conn.; Pratt & Whitney of Missouri; Ranger Aircraft Engines; Jacobs Aircraft Engine Co.; Lycoming Division—Aviation Co.; Chevrolet Motor Co.; Buick Motor Co. (Allison Division); Ford Motor Co.; Packard Motor Co.; Continental Motor Co.; Continental Aviation & Engine Co.; Chrysler Motor Co.; Studebaker Corp.; Bendix Corp.; Nash Kelvinator Co.; Dodge Chicago Plant; Waukesha Motor Co.; Aircooled Motor Corp.; General Electric Co.; Chandler Evans; U. S. Navy and U. S. Army Air Corps.

Concrete Hog Troughs

(Continued from page 92

pany has concentrated on production of the feeding bowl, but plans for the future include the manufacture of fence posts, flagstones, and, through a contract recently concluded with the War Department, concrete practice bombs. Tests have been conducted with the assistance of the Portland Cement Association on relative strengths of the fence posts using different types of reinforcing. The posts are 7 ft. long, are triangular in shape, and are 4 in. on a side.

Unreinforced concrete flagstones, octagonally shaped, 2 in. thick and about 14½ in. across, have been made but not in any great quantity. This product is also vibrated to insure a smooth finish. Future plans include the use of coloring material in the concrete so that these stones may be produced in various colors for decorative purposes.

Concrete practice bombs, weighing 100 lb. each and shaped similarly to the real bombs were put into production on October 16 of this year. About 250 are produced daily. The requirements of the War Department are that the bombs must be very accurate in shape, dimension, and must have a smooth finish. This company is capable of meeting these requirements.

Window cards and small folders are used to merchandise the "Boyer Logical Bowl." The folders are mailed to farmers and retail farm dealers in the surrounding territory. This product is also sold to large local retail general merchandise stores. It may be shipped to any destination with no concern about chipping or cracking. Many testimonial letters have been received by Mr. Boyer from satisfied farmers informing him of the practicability and advantages of the bowl.

During the eight year period in which Mr. Boyer has been producing this product, he has placed more than 50,000 on the market.

Active Block Business

C. W. KOEHLER CEMENT BLOCK CO., Upper Sandusky, Ohio, has developed a thriving concrete block business since the plant was purchased in April, 1944. Mr. Koehler also operates two ready mixed concrete units. He has also started a concrete burial vault department with W. C. A. Bickham in charge.

To Make Block

JOE M. CLARK, Vancouver, Wash., is reported to have received a permit from the Clark County Planning Commission to construct a concrete block plant on the Mill Plain road east of the McLoughlin Heights housing project.

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***Better* Johnston Steel Racks and Pallets** . . . are built on order to suit your needs. They are the most economical and efficient that can be made for your plant requirements. Johnston racks and pallets are already giving complete satisfaction in numerous plants. Let us handle your requirements.

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Any size or style screen, in thickness of steel wanted with any size perforation desired.
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COMMERCIAL
CLOSE CLEARANCE
PRESTEEL PALLETS

For making perfectly-formed, sharp-edged concrete block rely on the accuracy and uniform dependability of COMMERCIAL Steel Pallets, as are hundreds of manufacturers today.

Light, indestructible and warp-proof, COMMERCIAL Steel Pallets are the backbone of high quality block production. They are die-made to insure uniformity and accuracy. They assure more uniform and quicker curing of the green units. Ribs are pressed into the pallets to impart both strength and mortar grooves into the bottom of the concrete block.

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The RIGHT MACHINE For a BIG PROFIT Sideline

MULTIPLEX FLUE-BLOCK MACHINE

Only small investment needed to make $30 to $50 profit per day.

HERE is the only chimney block machine on the market that makes an absolutely fire-proof ventilated basement and house. The Multiplex chimney, shown at right, can be made on this machine to meet any code or specification. It is built to give perfect draft and ventilation.

The Model "E" 16x16 Ventilated Chimney Block Machine is a great money-maker for wide-awake producers. It has attachments for ventilator and stove-pipe opening. Simple, easy and profitable to operate.

Write today for details.

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ELMORE, OHIO

Restore Old Buildings with Concrete Materials

Old dairy barn with new concrete foundation before application of cement asbestos siding to walls. Concrete masonry milk house in foreground.

Better than new with concrete foundation and cement asbestos siding, this dairy barn is now a valuable farm asset.

THIS old dairy barn was completely restored, for many more years of useful service, with concrete masonry and cement asbestos siding and shingles, all of which are readily available throughout the country. Timely repairs with these materials can increase the firesafety and usefulness of farm buildings everywhere.

There's no shortage of concrete and cement asbestos materials for building repairs, maintenance and improvements.

Concrete builders should let farmers know that necessary improvements can be made now without the use of scarce materials.

We have suggestions for inexpensive advertising to use with farmers. Send for your copy of "Restoring Old Farm Buildings With Concrete." Free in United States and Canada.

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Dept. 11-45, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete...through scientific research and engineering field work

BUY MORE WAR BONDS

Washington News

New O.P.A. Agstone Price Formula

(Continued from page 31)

place, and his obligation to keep records sufficient to verify such prices shall be the same. The transferor shall either preserve and make available, or turn over to the transferee all records of transactions prior to the transfer which are necessary to enable the transferee to comply with the record provisions of this section.

(Sections 5, 6 and 7 deal with records, enforcement, and licensing.)

Sec. 8. Protests, petitions for amendment and applications for adjustment—(a) Protests and petitions for amendment. Any person desiring to file a protest against or seeking an amendment of any provision of this regulation may do so in accordance with the provisions of Revised Procedural Regulation No. 1, issued by the Office of Price Administration.

(b) **Applications for adjustment.** The Price Administrator may adjust the maximum price established by this regulation for any producer of agricultural liming material who shows in an application for adjustment (1) that there exists a shortage of supply; (2) that his maximum price will not permit him to continue his production of agricultural liming material without subjecting him to substantial hardship; (3) that the loss of the producer's production would force purchasers to resort to higher priced sources of supply; and (4) that the provision of section 10, Rule 3 of this regulation does not grant him the required measure of relief: **Provided,** That in no instance may the average base period (see section 9 (f) f. o. b. plant price per ton be increased by an amount in excess of the difference between the production cost per ton during the base period, computed in accordance with the provisions of Rule 3 (i), below, and the similarly computed production cost per ton for the most recent calendar 3-month period. Such an application for adjustment must be filed in accordance with the provisions of Revised Procedural Regulation No. 1.

(Section 9 deals with definitions.)

Article II—Maximum Prices

Sec. 10. Sales by producers. (a) The maximum price which a producer may charge on sales of bulk agricultural liming materials, f.o.b. his plant shall be the highest price determined according to Rule 1, Rule 2, or Rule 3 and paragraphs (b) and (c), of this section, as the producer chooses. For sales in bags, Rule 4 shall be used. For sales at stockpile or railroad siding, Rule 5 shall be used. For sales on delivered, or delivered and spread basis, Rule 6 or section 12 shall be used. Prices of new producers shall be determined under section 13 below.

Rule 1. Maximum prices based on March or April, 1942, ceilings. The maximum price determined according to this rule shall be the highest f.o.b. plant price the producer charged each class of purchaser for the same or similar kind and grade during March or April, 1942. (If a producer had no f.o.b. plant price or no bulk price during this period see paragraph (b) or (c) below.)

Rule 2. Maximum prices based on AAA awards. The maximum price calculated according to this rule shall be the f.o.b. plant price at which an award was made to the producer by the Agricultural Adjustment Agency between September 12, 1942, and May 15, 1943. If sales to other classes of purchasers were customarily made at higher or lower prices than such AAA award price, the higher price may be maintained or the lower price shall be maintained as the case may be, by adding to or deducting from such award price the customary dollar-and-cent differential. (If a producer had no f.o.b. plant price or no bulk price during this period see paragraph (b) or (c) below.)

Rule 3. Maximum prices based on base period average prices. Instead of following Rule 1 or 2 the producer may calculate a new maximum f.o.b. plant price for bulk material in the following manner:

(i) Compute the cost per ton to produce agricultural liming material during the base period (see section 9(f)) by adding the applicable items of production cost (such as labor, raw materials, power, heat, maintenance, repair and depreciation of equipment, rentals, insurance, and taxes, except income and excess profits taxes) and dividing the total by the number of tons produced during such period. (If it is impossible for the producer to segregate from his records the production cost of agricultural liming material he may base this calculation upon the entire output of his plant of all lime or limestone materials. In case a producer operates more than one plant he may make the computation for each plant separately or he may combine the applicable data from all his plants into a single computation.)

(ii) Compute the cost per ton to produce bulk agricultural liming material in the manner described under (i) above for the six-month period ending April 30, 1943.

(iii) Subtract the figure obtained under (i) above from the figure obtained under (ii) above and add the difference to the average bulk, f.o.b. plant price

Steelcar **ROLLING TRUNNION**

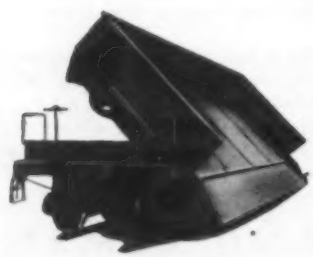
Automatic

AIR DUMP CARS

Generally the development and operation of open pit mines involve the continuous stripping of large amounts of overburden that have to be hauled to waste dumps. Pressed Steel air dump cars in various types and capacities are used extensively in this work.

As the overall cost of operation frequently determines the success or failure of such mines and since loading, transportation and dumping of the overburden constitute important elements of cost, it becomes a matter vital to the success of the project to select cars especially adapted to the requirements.

In most cases, the largest car that can be used will prove the most economical. The initial cost per cubic yard of car capacity will be less, maintenance cost on the same basis will be lower, a better ratio of dead weight to pay load will be secured, the tonnage per pound of locomotive tractive effort will be correspondingly greater and power shovel operation will be more continuous.



Write for Bulletin No. 72-C—containing illustrated, informative information on AIR DUMP CARS.

PRESSED STEEL CAR COMPANY, INC.
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during the base period to each class of purchaser. (If a producer had no f.o.b. plant price or no bulk price see paragraph (b) or (c) below.) The amount so added may not exceed either 30 cents per ton or 15% of the lowest average base period price charged to any class of purchaser, whichever is greater.

(iv) Every producer who follows this rule in computing a maximum price shall submit to the Office of Price Administration, Washington, D. C., in writing, the detailed figures upon which his computation is based.

Rule 4. Maximum prices for sales in bags. For sales of agricultural liming materials in bags the producer may add to the maximum bulk f.o.b. plant price as otherwise determined hereunder, 25 cents per ton plus a sum not in excess of the established maximum price, at the time of the sale of agricultural liming material, for the bags containing the ton: **Provided, That,** where a producer charged during March or April, 1942, a differential for bags and bagging higher than that permitted above, such higher differential may be maintained.

Rule 5. Maximum prices for sales at stockpiles or railroad sidings. Where the producer establishes a stockpile at a place other than in the vicinity of his plant, or ships from a railroad siding not in the vicinity of his plant, he may add to the maximum price as otherwise determined hereunder, an amount equal to the actual cost of him of handling and transporting the material from his plant to the stockpile.

Rule 6. Maximum prices for a delivered or delivered and spread sale. The producer's maximum price under this rule shall be his applicable f.o.b. plant, stockpile or railroad siding price as otherwise established hereunder, plus an amount equal to his handling and delivery cost, plus his cost of spreading, if any. (For flat delivered price, see section 12 below.)

(b) **Calculation of an f.o.b. plant price from a delivered price.** Where the producer had no f.o.b. plant price to which to apply Rules 1, 2 or 3 above, his f.o.b. plant price shall be calculated by deducting from his delivered, or delivered and spread, price an amount equal to his average cost of delivery, or delivery and spreading, of the agricultural liming materials, during the applicable period. Where the producer's delivered, or delivered and spread, prices varied among delivery areas, he shall calculate his f.o.b. plant price by deducting from such delivered price in the county or political subdivision in which his plant is located, or nearest thereto, an amount equal to his average cost of delivery, or delivery and spreading, of the material in that delivery area, during the applicable period.

(c) **Calculation of a bulk price from a bagged price.** In case a producer had no price for sales of agricultural liming material in bulk he may compute a bulk price by deducting from his bagged price the cost of bags and bagging during the applicable period.

Sec. 11. Sales by non-producers of agricultural liming materials—(a) Sales at wholesale. The maximum price that may be charged for agricultural liming material when sold by a person who did not produce the material to a person other than the ultimate consumer shall be the sum of the following:

(1) The maximum price that the producer could have charged the seller for the material as determined under section 10, above, plus

(2) The cost to such person of handling and transporting the material to the point of delivery, plus

(3) The customary or average dollar and cents markup over such costs which he charged during the base period (see section 9(f)).

(b) **Sales at retail.** The maximum price that may be charged for agricultural liming material on sales to the ultimate

(Continued on page 106)

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Mining Institute Meeting

(Continued from page 66)

pegmatites. Many of the crystals range from 4- to 8-in. size and the largest run up to 5-ft. maximum dimension, many weighing 500 lb. and some as much as a ton. One of the field trips, after the business sessions, took a group to Beryl Mountain to inspect the crystals.

In her paper, "Exploration of Pegmatites in the Eastern United States," MARGARET FULLER BOOS, U. S. Bureau of Mines, described the Bureau's program of exploration in the development of industrial mineral deposits and discussed the unpredictability of mineral-bearing bodies. She described the occurrences of mica and other strategic minerals and the application of diamond drilling which is a recent development of the Bureau of Mines, all the while emphasizing that thorough exploration reduces the financial hazards in mining.

Garnet, Carborundum

In the absence of FRANK C. HOOPER, vice-president, Barton Mines Corp., O. C. Ralston read his paper on "Abrasive Garnet Operations in the Adirondacks." Barton Mines is a pioneer in this field and has the largest known operations on garnet in the world at North Creek, N. Y. Crystals up to 2½-ft. diameter weighing a ton are mined. A characteristic of the garnet is that there is a rim of pure hornblende around each crystal. The deposit is quarried on three 35-ft. levels using wagon drills and there is a haul of 1000 to 1500 ft. into the plant. Processing of the grains is done by heavy media separation equipment.

Garnet is extensively used as an abrasive, for glass before the rouging operation, for wood to be shellacked and varnished, for felt, rubber and bakelite, to mention a few uses. The hardness of garnet is 8 on the hardness scale and the grains have a "self shaping" characteristic when put to use as an abrasive.

Carborundum is extensively used as a grinding medium for bombsights, torpedos, armor plate, eyeglasses, etc. This mineral was the subject of a paper by R. D. PARKS, Miscellaneous Minerals Branch, W. P.B. The United States is the principal user of carborundum but most of the tonnage has been imported. The industry is a small one that has to compete with synthetic products, but the crystalline structure and hardness of natural carborundum is said to be superior to synthetic substitutes. Principal use is for metal finishing and glass finishing. When surpluses of carborundum became depleted during the war, steps were taken to increase the available supply. Dumps were reworked in Canada and the Elk Creek mine in Montana was reopened. According to the author, there is a need for more sources of supply and better methods of beneficiation. Montana has promising postwar possibilities for further development.

Celestite, Sulphur, Clays

GLENN L. EVANS, Bureau of Economic Geology, University of Texas, in his paper, "Texas Celestite," discussed the deposits in Nolan and Brown counties in Central Texas where large reserves of sub-chemical grade have been proven. The only commercial celestite mined is from blanket deposits but it occurs mainly in nodular disseminated deposits and in cavern deposits. Mining is done by working simple outcrops by the use of hand tools, followed by hand sorting and loading. Principal use of celestite is for an admixture in rotary drilling muds, in the refining of caustic soda and in the production of strontium salts. The better grades have been imported from Mexico and England.

Other papers presented were one on "Common Forms of Sulphur in the World Markets," by W. W. DUECKER, Texas Gulf Sulphur Co., one entitled "Some Geological Aspects of the Industrial Mineral Prob-

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lems of New England," by H. M. BANNERMAN, U. S. Geological Survey, the "Role of U. S. Bureau of Mines in Investigating Strategic Mineral Resources of New England," by JOHN BARDILL, District Engineer for New England, U. S. Bureau of Mines, and the "Nature and Origin of a Highly Refractory California Clay," by T. F. BATES, School of Mineral Industries, Pennsylvania State College.

Mr. Duecker used slides to illustrate the handling of sulphur in molds and ingots. Mr. Bannerman's paper emphasized the important part that a knowledge of geology has in the exploitation of industrial minerals, where profits are low and uncertainties are a hazard. The industrial minerals industry does not recognize the value of geological knowledge to sufficient extent, in his opinion. Immediate needs in the New England area, he said, are for systematized mapping and exploration and the discovery of new mineral deposits for exploitation to replace high grade mineral deposits that have been gutted. The Bureau of Mines has been doing a great deal of work in the area in investigating strategic mineral resources. Mr. Bates' paper was concerned with three different types of California clays, each of which varies in refractiveness.

Papers on "An Aggregate for Light-Weight Concrete," by C. H. MOORE, JR., School of Mineral Industries, Pennsylvania State College, and "Modern Ore Dressing Methods Give America a Superior Pumice Stone Product," by JAMES A. BARR, JR., Chemical Division, Armour & Co., were not read in the absence of the speakers.

Mica Field Trip

More than 60 members of the Institute made the trip to the mica pegmatite district of the Monadnock region north of Keene, N. H. Edward Ellingwood, chairman of the New Hampshire Mineral Resources committee, directed the trip and furnished bus and automobile transportation for the entire group, following luncheon at the Hotel Ellis in Keene.

Four mica mines were visited, the Victory, Big, Blister and Nichols mines, all of which are privately owned and are being operated for critical sheet mica under the government-sponsored program. Some equipment has been leased to the operators under agreement with the Colonial Mica Corp.

All the mines are similar, with the mica occurring in association with high grade feldspar. Original workings in the area date back a hundred years but have been resumed on an enlarged scale, principally to get out plus 1-in. sheet mica for war needs. The sizes of sheet range up to 8 in. and bring as high as $8 per lb. for the finest grades. Fine mica and host rock are being accumulated in spoil piles, but scrap and grinding mill equipment will be installed in the district for processing the scrap and fines.

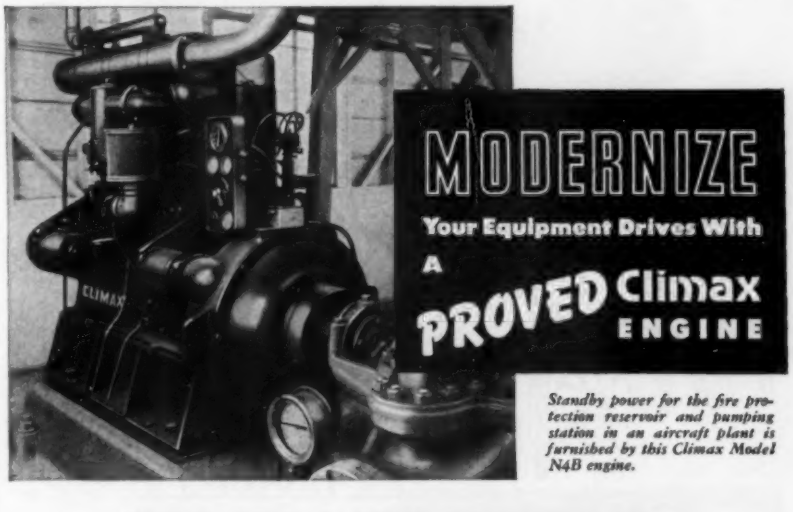
Methods of operation are practically identical in all four mines. The Victory mine is said to have been opened originally back in 1820 and has been worked alternately for mica and feldspar. The mine level is about 110 ft. below the surface and horizontal tunnels are being extended according to the location of the mica-bearing vein, which is 2½ to 3 ft. thick topped by a "shale."

Mining consists of drilling 1-in. blast holes into the vein, usually in a horizontal or near-horizontal direction, with drifters and blasting a section down. The loose material is shoveled into wheelbarrows and the plus 1-in. sheet is sorted out by hand, under electric lights, and filled into bags. The rest of the material is wheeled out for hoisting out of the mine to the spoil pile.

This mine has a production of 30 to 55 tons per month and the normal full crew of 33 men is paid on an hourly basis.

The Big mine is being worked at a 220-ft. level and the Blister mine at a 65-ft. level. In the latter mine, mica in some places occurs up to 40 percent of the total rock, but the range is from 5 percent up throughout the district. Mica from all the mines is picked, sorted and cut in trimming shops at Keene, for delivery to the Colonial Mica Corp. at Newport, N. H. From 8 to 10 lb. per

(Continued on page 106)



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ton of mica processed at Keene is classified as high grade.

Feldspar Milling

The field trip to the mica mines was followed by an inspection trip through a large mica trimming and preparation plant in Keene and inspection of the Golding-Keene Co. feldspar grinding mill in Keene. Feldspar is quarried at Alstead, N. H., where it is crushed through two jaw crushers, with a picking belt between, to approximately 1½-in. size for delivery by trucks to the milling plant. Fines from crushing in the quarry are wasted since the bulk of impurities break down in crushing. A stockpile is maintained under cover at the milling plant where a power-operated bottomless bucket reclaims the feldspar for further processing. A Telsmith fine-bowl gyratory crusher and a series of crushing rolls, each in closed-circuit with a mechanical vibrating screen, produce a 16-mesh product for glass manufacture. A finer product, 94 percent minus 325 mesh, is produced through a Hardinge ball mill with air separation. Details of the operation were described by J. A. Dennis, vice-president and general manager of the company.

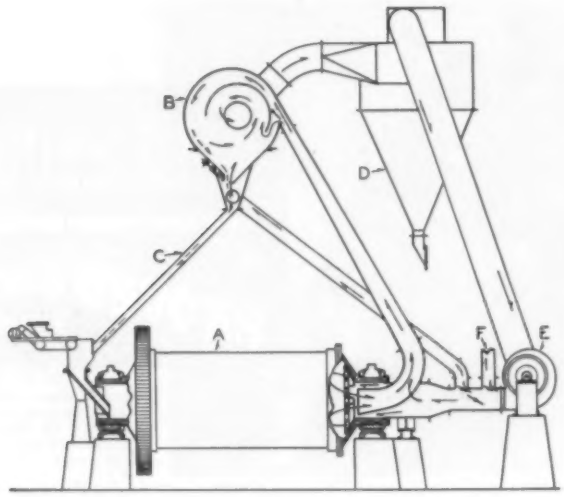
Screening Out Flat Rock

DEVELOPMENT of a new-type screen to remove much of the objectionable flat rock from crushed stone produced for concrete work was announced recently by the Bureau of Mines.

Due to rigid specifications of contractors, crushed stone sometimes is rejected because it contains excessive amounts of flat and elongated pieces mixed with the preferred cubical-shaped material. The new apparatus, constructed and tested by Lloyd H. Banning, a metallurgist at the Bureau's Eastern Experiment Station, College Park, Md., segregates the flat pieces from the cubical-shaped pieces.

According to a publication just released by the Bureau, the screen may be adapted for use on many standard vibrating screens and the cost of operation is approximately the same as that of any commercial screening operation.

A copy of the publication, Report of Investigations 3781, "A Vibrating Screen Surface for Removing Flat and Elongated Pieces from Crushed Stone," may be obtained without charge from the Bureau of Mines, Department of the Interior, Washington 25, D. C.



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O.P.A. Agstone Pricing

(Continued from page 103)

consumer or a department or agency of the United States Government, when sold by a person (including truckers) who did not produce the material, shall be the sum of the following:

(1) The maximum price that the producer or wholesaler could have charged the seller for the material, plus

(2) The cost to such person of handling, transporting and/or spreading the material, plus

(3) The customary or average dollar and cents markup over such costs which he charged during the base period (see section 9(f)).

Sec. 12. Sales at flat prices. Any seller of agricultural liming materials may charge for deliveries within any single county or political subdivision thereof, one maximum flat delivered, or delivered and spread price. In calculating his maximum flat price, the seller shall include therein his handling and delivery cost, and his costs of spreading, if any, by listing all, or a representative group of, his prospective deliveries and spread sales, in the particular county or political subdivision thereof, and averaging his actual or estimated costs of such handling and delivery, or costs of delivering and spreading, as the case may be, in such county or political subdivision thereof.

Sec. 13. Sales by new sellers. Where a person operates at a new point of production or commences the business of selling agricultural liming materials after the effective date of this regulation, his maximum price to each class of purchaser is the maximum price for a like sale of the same or a similar kind or grade of agricultural liming materials of his most closely competitive seller of the same class: **Provided, That,** where a producer uses portable equipment (i. e., mounted on wheels so that it may be moved from one site to another) his maximum price at the new point of production shall be his established maximum price at his nearest other point of production or the maximum price of his closest competitor at the new point of production who likewise uses portable equipment, whichever is lower. Such new seller shall report to the Office of Price Administration, Washington, D. C., the new maximum price so established and the name and address of the competitor whose price was adopted.

The effective date of this order is October 12.

Crushed Stone Meeting

(Continued from page 84)

E. W. BAUMAN, field engineer, National Crushed Stone Association, asked the members to tell him what regional problems are bothering the industry. Mr. Bauman referred to the gravel-crushed stone sub-base specification in Illinois. He said there is at present no differential in the specification for pit run gravel as compared with crushed stone. He suggested that pit run gravel should be crushed to be comparable with crushed stone.

Mr. Bauman said that the costs of water-bound macadam would compare favorably with soil-cement stabilization, and urged the promotion of this type of pavement.

Post-war airport construction is expected to open up a large market for crushed stone. Congress is now considering the Randolph bill which will provide one billion dollars for airport construction. Stone producers, said Mr. Bauman, should get acquainted with C.A.A. regional officials. The C.A.A. program will bring a large amount of business to the industry.

Post-War Markets

After the luncheon, J. R. BOYD, Administrative Director, addressed the meeting. Mr. Boyd reviewed the post-war construction program. He said that the first year's expenditure would amount to two billion dollars of which 704 million dollars would be for highways. About 27 percent of this program is definitely planned or in the design stage. It is expected that there will be a definite construction program under way in six months. Mr. Boyd referred to the highway bill which was passed by the House and will be placed before the Senate when it reconvenes. There are some differences between the Senate bill and the House bill which was passed that will have to be ironed out. He said that the producers can do much to expedite passage of this legislation. It is highly important that the bill be passed as soon as possible as 45 state legislatures will be meeting in 1945, and they will have to pass enabling legislation to carry out their part of the federal-state program.

Following Mr. Boyd's talk on present and post-war conditions in the industry, there was a general discussion on regional organization of the Association to better serve the industry.

Registration

B & M Quarry, Ottumwa, Iowa; K. Kinsey and B. Ravitz.

Columbia Quarry Co., St. Louis, Mo.; Floyd W. Mumma.

Concrete Materials & Construction Co., Cedar Rapids, Iowa; S. F. Moore.

Consumers Co., Chicago, Ill.; H. A. Clark and Charles J. O'Laughlin.

Dolese & Shepard Co., Chicago, Ill.; W. J. Lynch and Wm. J. Steffel.

Dubuque Stone Products Co., Dubuque, Iowa; Paul M. Nauman.

East St. Louis Stone Co., East St. Louis, Ill.; Wm. E. Hewitt and M. E. McLean.

Elmhurst-Chicago Stone Co., Elmhurst, Ill.; Geo. F. Hammerschmidt.

France Stone Co., Toledo, Ohio; Edward F. Healey, Ray J. Kiley and C. E. Stimming.

Lehigh Stone Co., Kankakee, Ill.; D. S. Pickett, Dan Sanborn and G. A. Shunk.

Marquette Cement Manufacturing Co., Chicago, Ill.; D. S. Colburn and S. L. Cribari.

Material Service Corp., Chicago, Ill.; Irving Crown and George W. Lenzie.

Monon Crushed Stone Co., Monon, Ind.; Mrs. Grace M. Evans and William B. Newman.

National Stone Co., Joliet, Ill.; W. N. Carter.

Schield Soft Limestone Quarry, Waverly, Iowa; Vern Schield and W. L. Schield.

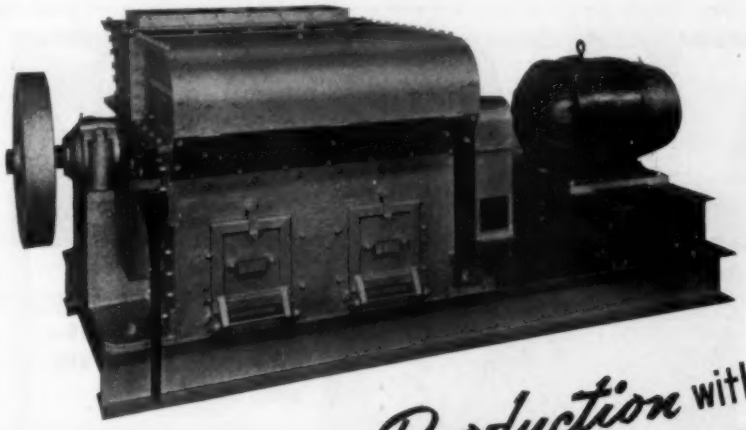
GUESTS:

Kensington Steel Co., Chicago, Ill.; Russell J. Williams.

National Crushed Stone Association, Washington, D. C.; E. W. Bauman, J. R. Boyd and A. T. Goldbeck.

Pit and Quarry, Chicago, Ill.; W. M. Avery, Barry James and S. A. Phillips.

Rock Products, Chicago, Ill.; B. Nordberg, Nathan C. Rockwood, H. E. Swanson and R. S. Torgerson.



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A.A.A. Meeting

(Continued from page 82)

accessible than the heavy and light trucks.

O.P.A. Information

The final speaker at the morning session was Henry Huschke of the Agricultural Chemical section of the O.P.A. He stated that since the inception of the O.P.A., 48 price adjustments have been made in Illinois and that 391 price adjustments have been made nationally. His figures also showed that 48 new plants have been started in the country, mostly in the North Central region. While attempts have been made to set standard prices, the variation in quality of limestone in various sections is too great to set a single standard price. Therefore, in order to standardize prices as well as possible, a regulation has been written which freezes prices at a certain date. A new O.P.A. Trade Bulletin, Revised Maximum Price Regulation No. 386, effective Oct. 12, 1944, has been published, concerning liming materials. Since Rule 3 of the Bulletin, dealing with ceiling prices based on base period average prices will not adequately take care of certain peculiar conditions in plant operations, a section has been included which concerns "Individual Adjustments for Producers." This section reads as follow (see page 31 for details):

John Spencer, Illinois Agricultural Association, and E. J. Krause in a huddle over a problem of mutual interest

"If you cannot get relief under Rule 3, you may apply to the Office of Price Administration, Washington 25, D. C., for adjustment of your ceiling prices. Your application must show:

"(1) that there exists a local or general shortage of supply;

"(2) that your ceiling price will not permit you to continue your production of agricultural liming material without substantial hardship;

"(3) that your loss of production would force buyers to resort to higher priced sources of supply; and

"(4) that the provision of Rule 3 of this regulation does not grant you the required measure of relief.

"In no case will the amount of the price increase per ton exceed the difference between the production cost per ton during the base period (figured by using Step 1 of Rule 3), and the similarly figured production cost per ton for the most recent calendar 3-month period."

Afternoon Session

The morning meeting adjourned at 12:30 and luncheon was served at the Orlando Hotel. Upon conclusion of the luncheon, a short meeting was held by the Midwest Agricultural Limestone Institute. E. J. Krause, president of the Institute, introduced E. E. DeTurk, Prof. of Soil Fertility, Dept. of Agronomy, University of Illinois, who spoke briefly on the agstone production of the past four years, and complimented the producers on their past efforts.

CLYDE M. LINSLEY, assistant professor of Soils Extension of the University of Illinois, then spoke on the value of agstone as a soil conserving agent. He stated that the big job for the future was to guide the farmer in the correct use of agstone. He also stated that agstone in itself is not sufficient to sweeten soils properly, but that it should be used in conjunction with phosphates and potash as well as proper rotation of legumes for growing crops.

Agstone Tonnage

JOHN SPENCER, Director of the Soil Improvement Department., of the Illinois Agricultural Association, then spoke on agstone tonnage in Illinois and discussed new plants that have gone into production in Illinois. Geological Survey figures show that 143 plants in Illinois produced 3,866,568

(Continued on page 110)

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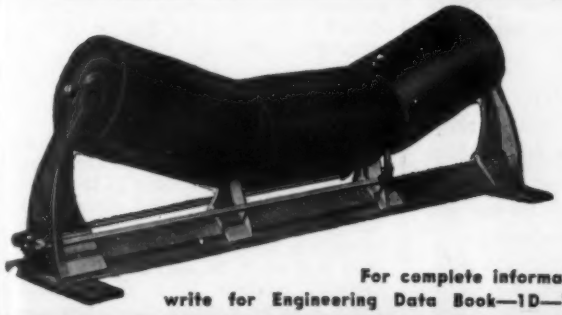

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A.A.A. Meeting

(Continued from page 108)

tons in 1942, while 103 plants produced 3,113,247 tons in 1943, a decline of 19.5 percent. This decline was due to lack of equipment caused by war restrictions. Predictions for 1944 are that the tonnage will equal that for 1942. He also stated that he personally knew of 20 new operations started in the past 12 months, some of which were plants resuming operations, while others were entirely new. In conclusion, Mr. Spencer predicted that liming operations on farms will become as necessary as plowing, seeding, etc.

Mr. Gentry of the A.A.A. then spoke briefly on general aspects of the industry. He said that the agricultural limestone field has just been scratched and that, while it is unfortunate that some people cannot as yet see the value of agstone, more and more users will be found as knowledge of the value of agstone is obtained.

Registration List

The registration was as follows:

F. W. Mumma, Columbia Quarry Co.
W. Carter, National Stone Co.
J. R. Spencer, Illinois Agricultural Ass'n.
C. A. Bernard, American Zinc, Lead, and Limestone Co.
C. M. Linsley, University of Illinois.
Worth Merritt, National Stone Co.
E. P. Lange, Consumers Co.
N. F. Schwarz, AAA.
J. Larry Fay, Material Service Corp.
Harry Combrink, AAA.
J. L. Jenkins, Potoka, Ill.
W. Stoffel, Dolese and Shepard Co.
Lee Gentry, AAA.
E. J. Krause, Columbia Quarry Co.
Guy Smith, AAA.
Robert M. Medill, Director Dept. of Mines, State of Ill.
Wm. E. Hewitt, East St. Louis Stone Co.
Al Stotz, Waterloo, Ill.
Ellis Shumaker, Dixon, Ill.
Leo Lamb, Pontiac, Ill.
A. M. Park, Rocky Ford Limestone Co.
H. W. Doerr, AAA.
Henry Huschke, OPA.
W. E. Schmidt, Columbia Quarry Co.
E. E. DeTurk, University of Illinois.
Dan Sanborn, Lehigh Stone Co.
H. E. Swanson, Rock Products.

Mining Silica

(Continued from page 55)

most of the pipe handling but some handling by the men is, of course, unavoidable. Water lines are of No. 10 gauge standard spiral steel and sand lines are No. 12 gauge.

All the permanent or semi-permanent sand lines are rubber-lined, but the jet lines are not rubber-lined since they are constantly being moved and the weight of the rubber lining is a factor. Also, the rubber would be knocked out by the cutting action of chunks of sandstone up to 4-in. size. Under war conditions the company has had to use synthetic rubber pipe and pump linings and, at present, is using reclaimed rubber linings. While such substitute rubbers have proven satisfactory for belt conveyors they have proven much inferior to pre-war natural rubber at withstanding abrasion from sand when used for pipe and pump liners.

Officers of the company are P. S. McDougall, president; G. A. Thornton, vice-president and general manager; H. C. Thornton, secretary-treasurer. E. O. Schneider is sales manager and H. W. Schumacher, purchasing agent: W. B. Gyger is general superintendent and William Small is foreman in charge of the mining operations.

Cleaning up Quarry

J. L. MARTIN, Oakland, Calif., has been given a permit by City Manager Charles R. Schwanenberg to take out 70,000 cu. yds. of crushed stone from the quarry on Lincoln avenue near Mountain Boulevard. It was required that the work be carried out along definite contour lines that would leave a slope suitable for landscaping to conform to the natural beauty of the surrounding hillside.

Sand Plant Fire

CRYSTAL SAND CO., near Moundsville, W. Va., suffered a fire loss recently when its sand and gravel plant burned to the ground. The structure had not been in use recently.

TALCOTT BELT FASTENERS

The Handiest Fastener Made

for SPLICING ..AND.. PATCHING Conveyor Elevator and Transmission Belts

Only a hammer is needed to apply Talcott Fasteners.

Conveyor views of one of many plants that has standardized on Talcott Fasteners for their conveyor belting.

1 TALCOTT CONVEYOR BELT FASTENERS—Made in short sections which allow the belt its full pliability so it will readily conform to the trough idlers and also will run smoothly under trippers, scrapers and on tandem drives.

2 TALCOTT'S ACME STEEL PATCH FASTENERS—Don't discard a good belt because it has been torn by accident. Patch it with Talcott Acme Patch Fasteners and obtain the full value out of your belting. Patches are easily and quickly made.

3 TALCOTT CLINCHING FASTENERS—For all heavy transmission and elevator belting. Backs of fasteners are made extra strong to withstand most severe strain. The teeth pierce between threads of the warp of the belt, preventing belts from breaking at the joint.

A Fastener for Every Belt

W. O. & M. W. TALCOTT, INC.
92 SABIN STREET • PROVIDENCE, R. I.

Safety Congress

(Continued from page 86)

C. M. POLLARD, safety director of the National Gypsum Co., Buffalo, N. Y., presented a paper on "The Gypsum Industry Attacks Accidents." Mr. Pollard outlined the safety program of the Gypsum Association, an abstract of which follows:

Late in 1942 the Executive Committee of the Gypsum Association knew that most gypsum companies were faced with the problem of labor shortages, accelerated labor tournover, and the employment of a larger percentage of inexperienced workers. They knew that the safety work in the 56 plants operated by the 17 member companies was becoming increasingly important.

A safety committee consisting of one representative from each of five member companies was appointed. With the assistance of the National Safety Council and the committee of five met and formulated plans for a safety campaign to run during 1943. Twelve rules were drawn up to be followed in the campaign. Entries were divided into four general groups:

Class A—For all plants with an expected exposure of 400,000 or more manhours per year

Class B—200,000 to 400,000 manhours

Class C—100,000 to 200,000 manhours

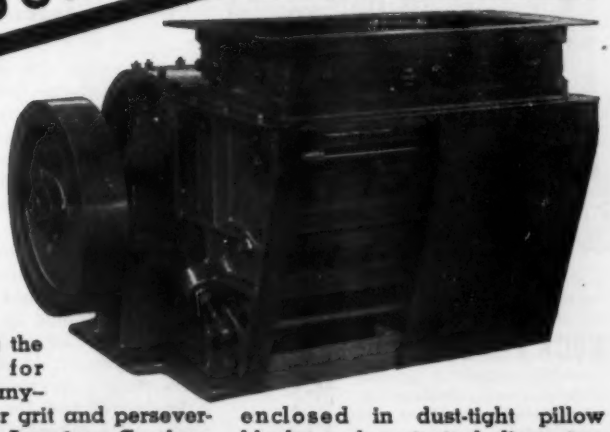
Class D—Up to 100,000 manhours for the 12-month period

Reports were to be submitted quarterly, and entries designated by key numbers. The standings of contestants were based on their frequency rates, the standard formula being used to compute such rates. Awards were to be given the winner of each class and also to all plants participating and reporting no lost-time accidents during the contest period. Eleven of the Association's member companies entered 46 plants in the 1943 campaign. The frequency rate indicated the gypsum industry was experiencing nearly 27 accidents per million manhours worked which compared with cement's rate of 7.8, quarry's 17, and the all-industry rate of 14.5.

For purposes of analysis the plants participating in the contest reported their accident experience under six classifications: mine, quarry, plaster plant, board plant, block plant, and miscellaneous. The committee summarized the 1493 experience and learned that nearly 48 percent of the accidents had occurred in the board plants, 18 percent in the mines, 14 percent in plaster plants, about 8 percent in quarries, and the block plants and miscellaneous contributed to 12 percent of the total. In relation to the percentage of manhours worked in the departments, 80 percent of the accidents had occurred in

(Continued on page 114)

AMERICAN CRUSHERS are rugged!



Rugged—that's the Army's word for any job or anything calling for grit and perseverance. The jobs American Crushers are doing day after day fit into that definition; for American Crushers themselves are ruggedly built. They are made of the finest, toughest materials — manganese steel wearing parts, alloy steel shaft, heavy duty anti-friction bearings enclosed in dust-tight pillow blocks and cast steel discs, two inches thick.

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Above is a Sauerman Scraper system with high tail tower reclaiming from 30,000-ton stockpile of dredged lake sand at plate glass plant. Scraper builds pile during Summer from surplus sand received by rail; reclaims in Winter when stockpile provides plant's entire supply of sand.

ASK any operator of a Sauerman Scraper or Cableway and he will tell you that this is the cheapest method of moving materials from pit, bank, pond or stockpile.

These machines dig, haul and dump in one operation and are adaptable to a variety of conditions and requirements.

Because they require but a single operator, consume little power in operation, and are easy to keep in good running order, they cut costs to the bone.

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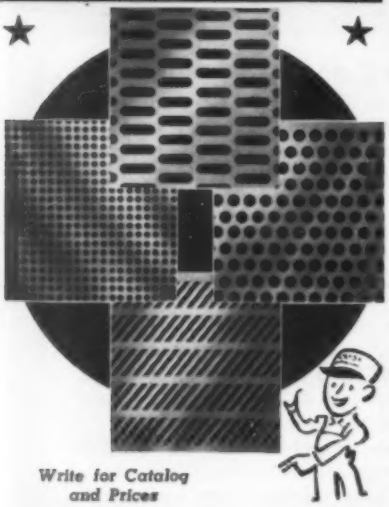

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The Harrington & King PERFORATING CO.

5650 Fillmore St., Chicago 44, Ill.
114 Liberty St., New York 6, N. Y.

Air-Entraining Cements

(Continued from page 39)

check and report the feed rate of dry vinsol resin regularly.

4. No pumping equipment is required.

Disadvantages When Feeding Dry Vinsol Resin

1. Because the powder is light in weight and the flake un-uniform in size special feeding equipment is essential for uniform feed rate.

2. There is a possibility of losing some of the dry resin from the grinding system by action of the dust collectors.

3. Economic disadvantage; more dry resin is required to produce the equivalent amount of air-entrainment attainable by the use of neutralized vinsol resin. The material cost, however, to add 0.030 percent dry resin is approximately four mills per barrel and the material cost to add 0.015 percent neutralized vinsol resin is approximately two mills per barrel.

4. Accurate weighing devices must be maintained and calibrated regularly for use in checking the dry resin feed rate at the grinding department.

5. Accuracy of proportioning is dependent on the accuracy of the clinker and gypsum feed rate.

Development of the use of neutralized vinsol resin has given rise to the hope that this form of addition will correct the adverse effect that dry resin has had upon air-entrainment in concrete when mixing of concrete is prolonged beyond specified limits. This theory is based on the knowledge gained within the past year pertaining to the alkali-resin reaction in cement.

Some preliminary tests with cement mortars using the Burmister Flow Trough[2]; for determining the amount of air-entrainment in neutralized vinsol resin and dry vinsol resin cements show that both cements develop an increase in amount of air-entrainment with an increase in mixing time. Inasmuch as the neutralized vinsol resin cement developed as large a percentage increase in air-content with longer mixing as did the dry resin cement when tested in laboratory mortars, it seems reasonable to assume that such a condition might also be true with neutralized resin in field concrete. Tables I and II are typical of many determinations made by the Burmister test. Table I represents tests made on production-ground, "fresh" cement treated with dry vinsol resin. Table II represents tests made on production-ground, "fresh" cement treated with neutralized vinsol resin.

It might be suggested that the alkali earths also have their effect on the air-entraining capacity of vinsol resin. With the adoption by A.S.T.M. of specification C 175—44T, we are provided with a tool that should aid materially in providing the answer to this very complicated cement and concrete durability problem as it pertains to the practical manufacturing problem of additions.

[2] Proposed Tentative Method of Test for Determining the Air Content of Portland Cement Mortar, Report of A.S.T.M. Committee C-1 on Cement, 1944.

Buy Refractory Property

GLADDING, MCBEAN & CO., San Francisco, Calif., has acquired the operating properties of Emsco Refractories Co., Los Angeles, Calif., with silica refractory plants at South Gate, Calif., and Lehi, Utah.

TABLE I—DRY VINSOL RESIN TREATMENT—0.026 Percent Resin
A.S.T.M. EA—C 150 Type II
Burmister Flow Trough Test 1-4 Mortar

Mixing Time	Rest	Final Mixing	% Air	Flow	ML H_2O	Remarks
30 sec.—30 sec.—60 sec.	90 sec.	60 sec.	14.2	2.7	196	Normal test procedure
30 sec.—30 sec.—60 sec.	90 sec.	120 sec.	14.7	3.0+	196	1 min. extra mixing time
30 sec.—30 sec.—60 sec.	90 sec.	120 sec.	15.1	2.4	192	Adjusted water to recommended flow. 1 min. extra mixing time.

TABLE II—NEUTRALIZED VINSOL RESIN TREATMENT—0.010 Percent Resin
A.S.T.M. C 175—44 T Type IIa
Burmister Flow Trough Test 1-4 Mortar

Mixing Time	Rest	Final Mixing	% Air	Flow	ML H_2O	Remarks
30 sec.—30 sec.—60 sec.	90 sec.	60 sec.	15.5	2.5	190	Normal test procedure
30 sec.—30 sec.—60 sec.	90 sec.	120 sec.	16.6	3.0+	190	1 min. extra mixing time
30 sec.—30 sec.—60 sec.	90 sec.	120 sec.	17.1	2.4	174	Adjusted water to recommended flow. 1 min. extra mixing time.

BLAW-KNOX BUCKETS

Write Headquarters for the Catalog You Need

No. 1586—Blaw-Knox Concrete Buckets.

No. 1606—Blaw-Knox Buckets for Contractors.

No. 1696—Blaw-Knox Buckets for Single Drum Hoists for use on Railroads. Mills, Foundries, Etc.

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No. 1757—Blaw-Knox 2 Line Lever Arm Buckets for Rehandling, Barge Cleanup, General Purpose, Hard Digging, Dredging.

No. 1865—Blaw-Knox 4 Rope Buckets for Coal, Ore and Cleanup.

BLAW-KNOX DIVISION of Blaw-Knox Company

2035 Farmers' Bank Bldg., Pittsburgh, Pa.

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Can travel 12 m.p.h., turn in 10½ ft., climb any ramp—hoists faster than 1 ft. per second and swings 12-18 ft. boom 90° to either side without outriggers for loading and accurately placing up to 10,000 lbs. Nimble, powerful, safe (no load ever over operator). Tier loader attachment if desired. Send for Specification CL-44.

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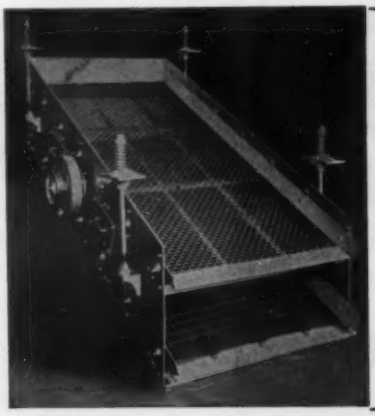
Hoists, Winches, Air Compressors, Truck Mixers, Mixers, Centrifugal Pumps



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CARRIES two payloads in one.
SAVES in first cost (up to 40%), on insurance (up to 50%), fuel costs (up to 20%), tires (50% to 100% longer life), road time (up to 20%), breakage of fragile loads, license fees, dead weight, maintenance costs.
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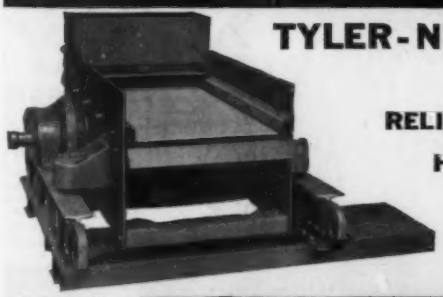

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Safety Congress

(Continued from page 111)

three departments having only 68 percent of the exposure.

To get at the facts a questionnaire was sent to all members of the association. Results revealed there had been 1394 accidents, including non-disabling injuries, and 21,903 days had been lost due to this experience. The committee learned that the physical condition of the plant, machinery and equipment did not cause the majority of the accidents. The unsafe acts of workers were predominating. These facts revealed to the committee that the greatest need for improvement was the training of workers by supervisors.

Contest standings at the end of June reveal a frequency rate of 21 for 1944. Compared with the 1943 figure of 27, this shows an improvement of six accidents for each one million manhours of operation. There have been 391 accidents, including non-disabling injuries. This compares very favorably with the total of 1394 for the year 1943. The number of days lost indicates the accidents have been less severe.

Unsafe Hand Tools

EDWARD FITZGERALD, Safety Engineer of the Marquette Cement Mfg. Co., Oglesby, Ill., spoke briefly on "Unsafe Hand Tools" and illustrated his talk with a collection of unsafe tools that he had acquired. The visual demonstration, together with his comments on the various tools, was highly instructive and forceful. He had more than 100 commonly recognized hazards illustrated in his display.

Lip Service

The Wednesday afternoon session was opened with the reading of a paper by J. A. TEHANEY, vice pres. of the Lone Star Cement Corporation, Kansas City, Mo., who spoke on "Lip Service." His remarks, in part, are as follows:

"Plant safety can never—anywhere—at any time—attain its full strength until management takes the lead. Then management must keep the lead until a strong safety program is fully developed and from that time on. Employes are sensitive to the attitude of the president's office. If the top executive says "Put safety first without exception or compromise," they know that he has established a definite policy for the plant and they'll follow it.

"The job of top management in the safety game is to run interference for the men. The job of the workmen is to carry the ball after the path has been cleared.

(Continued on page 116)

"WIRE SCREENS?
SURE BILL—BUY 'CLEVELAND'-WE DO!"

Tough, Durable, Accurate Wire Screens for Vibrators or Rotary Jackets

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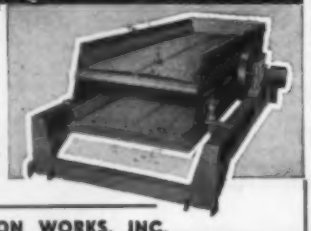

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SWING HAMMER PULVERIZER
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150-200 TONS OF CRUSHED ROCK PER HOUR

Steam Shovel sizes to 5" to 6" minus in one-operation

These heavy plate and cast steel constructed roller bearing JAW CRUSHERS have tremendous crushing power. Built to take it for continuous operation with minimum maintenance. Built in all sizes, stationary or portable.

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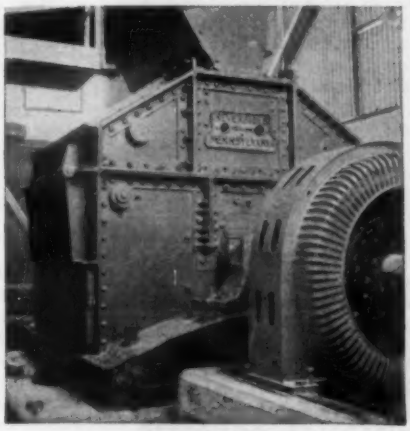

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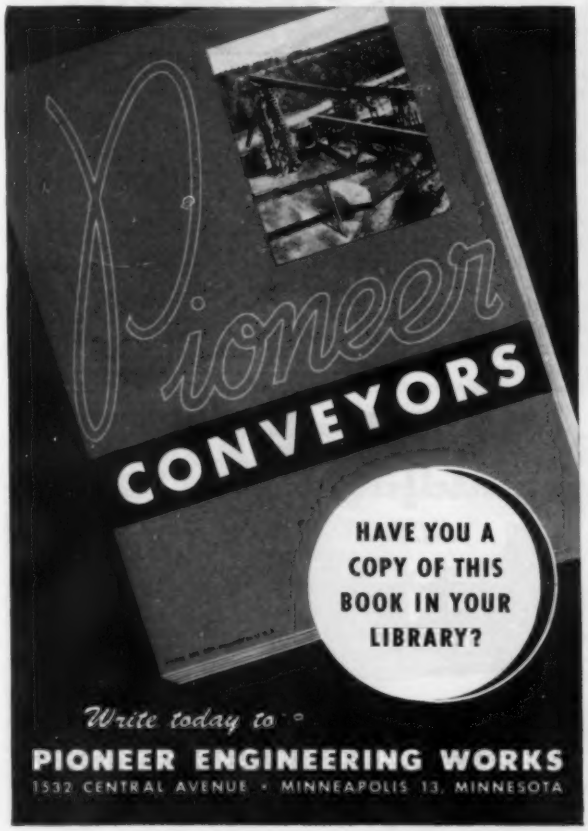

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Air Compressors

1—Ingersoll-Rand Duplex Air Compressors. Type XB 582 cu. ft., motor driven.

1—Ingersoll-Rand Imperial. Type XB-2, Duplex Air Compressor, 12" x 7½" x 12".

Coolers and Dryers

1—7 x 56 ft.; 1—10 x 90 ft. & others.

Cranes and Shovels

1—P & H 1-yd. **SHOVEL**, Gasoline. Reconditioned.

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2—No. 5 Gates **GYRATORY CRUSHERS**, Style D.

Others—Various types and sizes.

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1—Diesel Generator Set, 300 HP, Fairbanks-Morse Diesel, 6 cylinder, Model 32, complete with auxiliaries, 257 RPM, direct connected to a 250 KVA Fairbanks-Morse Generator, Type D, 3 phase, 60 cycle, 230 volts. V-belt drive to exciter. Complete with panelboards, etc. And Others.

Drilling Equipment

1—No. 40 I-R **DRILL SHARPENER** and Accessories.

1—No. 38 I-R Leyner **DRILL SHARPENER.**

1—Improved type No. 22 electric power Loomis Machine **CLIPPER DRILL**, with motor.

Grinding Equipment

2—5½ x 22' Allis-Chalmers **COMPEB MILLS.**

3—5½ x 20' F. L. Smidth **TUBE MILLS.** And Others.

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1—S. Flory Mfg. **SINGLE DRUM HOIST.** Handles 11-ton car up 12% grade 500 ft. per min.

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1—8 x 9½ x 180 ft. and Others.

Locomotive and Cars

1—4-ton Vulcan Iron Works, Class AW-4, Worm Gear **GASOLINE LOCOMOTIVE**, 36" gauge.

6—5-yd. Koppel 2-way **DUMP CARS**, 36" gauge.

Hammer Mills

2—Ajax Hammermills, size SXT-11 (1-R.H., 1-L.H.). Handles stone 300 tons per hr. 8" to 1½" each. Also spare parts.

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Large stock, rebuilt, AC or DC, 25 and 60 cycle.

Road Roller

1—Austin-Western "Autocrat" 10-ton with compressed Air Scarifier. New 1941. Gasoline.

Air Separator

1—14 ft. Sturtevant Air Separator. New 1941.

Magnetic Separators

3—Stearns High-Duty Magnetic Separators, 24" dia., 48" face. New 1939 and 1940.

Track Scale

1—Homestead (Carnegie - Illinois Steel) Standard Track Scale, 46'-100 ton capacity. Complete.

Turbine

1—100 HP Westinghouse Turbine, 2700 RPM, direct connected to 100 HP Westinghouse Gear Reducer. Ratio 3 to 1.

Safety Congress

(Continued from page 114)

"Accidents are a complete and unforgiveable waste of men, materials and money. If that isn't enough to catch and hold the interest of any good business executive, I don't know what is.

"The safety movement provides the best means of providing good labor relations because it promotes friendly contacts between the executive and the employe. That's what counts—good will and the spirit of helpfulness.

"Public relations of the company are invariably improved by good safety work. That is a thought for the executive to keep in mind.

"The prevention of accidents is an every-day-in-the-year job and the executive who desires a good record must remember that he cannot relax his vigilance and still expect the movement to continue gaining momentum or even hold its ground. Leadership in safety must be aggressive and dynamic."

Safety in Vision

M. M. BOWMAN, Eye Safety Consultant, Division of Labor Standards, U. S. Dept. of Labor, Washington, D. C., illustrated his extemporaneous talk on "Safety in Vision" with lantern slides. His very forceful speech was devoted to the importance of eye protection in all industries. He showed slides illustrating various injuries that can occur to the eye and results of improper care of the eyes.

Can It Be Done Better?

The final speaker was R. M. MERRILL, Bureau of Accident Prevention and Insurance of the Portland Cement Association. The following has been abstracted from Mr. Merrill's address:

He very clearly demonstrated the actual dollar returns from safety work as well as the definite gains in employe relations in his talk in which he raised the question, "Can it be done better?"

When workmen are taught properly, and safety performance beformance becomes a thoroughly fixed habit, said Mr. Merrill, causes for 90 percent of all accidents will be eliminated. The personal faults — improper attitude, lack of knowledge or skill, the use of unsafe dress or apparel (or lack of use of protective equipment or proper apparel), and in most cases one of the environmental faults — hazardous arrangement—which in the majority of instances is a personal fault, because the foreman or the workmen usually can prevent or correct it—all of these can be eliminated or greatly reduced through adequate use of the best educational methods, combined with methods already in use.

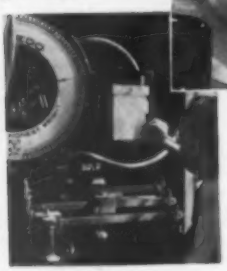
Among member companies of the Portland Cement Association, the personal faults mentioned were responsible for 59.7 percent of all accidents in 1943. Adding hazardous arrangement, 89.3 percent of all accidents in 1943 are accounted for. The remaining personal fault, physical or mental defect, many times could be detected at the time a man is hired, and taken care of either by remedial measures, proper placement, or if necessary, by rejection.

Mr. Merrill stressed the value of safety films to put across good safety practice to the employes in the educational campaign.

WHEN GERMANY FALLS
CONSTRUCTION STARTS
Prepare NOW for big business in CONTROLLED CONCRETE

Install [SC]² PRECISION CONCRETE CONTROL It Includes

Moisture Meter
Makes a test for moisture content of sand or stone in ONE minute. Accurate to ¼ per cent.



Compensator
Delivers correct DRY weight of aggregates and ADDED water. Makes a graph record of EVERY BATCH.

[SC]² CONTROL produces *uniform concrete.* Is always approved by concrete engineers. Has definite sales value. Write for our booklet "Profits in Concrete."

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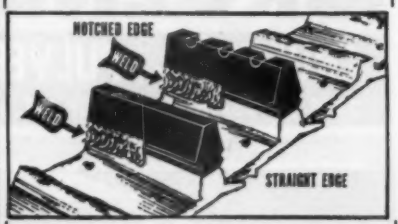
TRACTOR GROUSERS WITH BULLDOG *Grip-Lugs*



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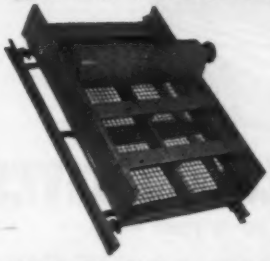

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Hayward makes all four—clam shell dragline, electric motor, orange peel
A Hayward recommendation is unprejudiced.

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a 'MAW-FULL' every Load—
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Our landing craft, which have put hordes of fighting men and machines on enemy shores with incredible speed, have impressed the world with their efficiency.

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EARLE C. BACON, Inc.

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Manufacturers' News

Farrel-Birmingham Co., Inc., Ansonia, Conn., and Buffalo, N. Y., announces the appointment of R. C. Wilson as sales manager of the Buffalo division, in charge of sales of gears, gear units, flexible couplings and related products.

Stearns Mfg. Co., Inc., Adrian, Mich., has been awarded a second star for the Army-Navy "E" pennant presented April 3, 1943, for the plant's excellent war production record.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced the appointment of three new works managers in the manufacturing division of the company, namely, Hugo W. Liebert, general works manager of the tractor plants; Fred S. Mackey, general works manager of the general machinery plants, and Harry E. Ladwig, works manager of the West Allis foundries and pattern shops.

H. K. Porter Co., Inc., Pittsburgh, Penn., has announced the appointment of Fred Grotts, president of its subsidiary, Fort Pitt Steel Casting Co., to the newly created position of director of research and metallurgy for all Porter plants.

John A. Roebling's Sons Co., Trenton, N. J., announces the election of Charles Roebling Tyson as president of the company, succeeding the late William A. Anderson. Mr. Tyson is the grandson of Charles G. Roebling, son of the founder, who became president when he was 28 years old and served in that capacity from 1877 to 1918. Lt. Joseph M. Roebling, now serving abroad with the U. S. Army Air Corps, has been named chairman of the Board of Directors. Lt. Roebling, first vice-president since 1936, is a son of the late Ferdinand W. Roebling, Jr., who was the company's president from 1926 to 1936. Lt. Col. F. W. Roebling III, with the U. S. Army Corps of Engineers, retains the position of vice-president.

Mack Trucks, Inc., New York, N. Y., has announced the return of M. C. Horine as sales promotion manager following his resignation from the War Production Board. For the past year Mr. Horine had been research consultant to the director of the automotive division of the W.P.B. with offices in Washington.

American Chain & Cable Co., Inc., Bridgeport, Conn., has appointed Russell H. Foss district sales manager for the New York district of Hazard Wire Rope Division. Mr. Foss, who has been with the company for six years, will continue to make his headquarters at 230 Park Ave., New York, N. Y.

The Timken Roller Bearing Co., Canton, Ohio, has announced the appointment of Howard C. Sauer as general manager of the newly created foreign division, which will handle the sales and service of the company's products in the world market outside the U. S. A., with headquarters at Canton, Ohio

E. I. duPont de Nemours & Co., Wilmington, Del., has announced the appointment of T. R. Carlson as director of production, explosives division. He will succeed F. R. Wilson, recently promoted to be manager of the division.

L. B. Foster Co., Pittsburgh, Penn., has opened a Pacific Coast office in the Russ Building, San Francisco 4, Calif., under the management of William H. Scanlon.

The Timken Roller Bearing Co., Canton, Ohio, has announced the appointment of A. F. Sprankle as metallurgical engineer in the Timken Steel and Tube Division. He was formerly manager of the alloy bureau of Carnegie-Illinois Steel Corp., Pittsburgh, Penn.

HAMMOND MULTI-WALL PAPER BAGS

HAMMOND Betterbags WELLSBURG, W.VA.

Sewn and Pasted Open Mouth and Valve Paper Bags. Your Inquiries Invited. WRITE TODAY!

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Paper Mill and Bag Factories WELLSBURG, W. VA.

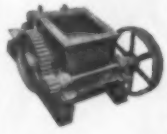
TRACK HAULAGE IS CHEAPER HAULAGE

PLYMOUTH LOCOMOTIVES

• FROM 2½ TO 70 TONS •

PLYMOUTH LOCOMOTIVE WORKS

Division of The Fate-Root-Heath Co. • PLYMOUTH, OHIO, U. S. A.



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Single and double roll and jaw crushers, hammer mills, super dry pans—steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists.

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Complete portable, semi-portable and stationary crushing, screening, and washing plants for different capacities of any materials.

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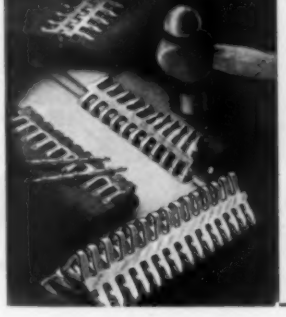
ARMSTRONG-BRAY STEELGRIP FLEXIBLE BELT LACING



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11 sizes boxed or in long lengths for wide conveyor belts. Best for rubber and fabric belts because it compresses belt ends and prevents fraying. Applied in a few minutes with a hammer. 2-piece hinged rocker pins.

Also, WIREGRIP Belt Hooks that fit any lacing machine. IMMEDIATE DELIVERY on both types.

Write for Circulars.

Armstrong-Bray & Co.

"The Belt Lacing People"

5306 Northwest Highway

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Wickwire Spencer Steel Co., New York, N. Y., has moved the purchasing department to River Road, Buffalo, N. Y., adjacent to the company's Buffalo plant.

Macwhyte Wire Rope Co., Kenosha, Wis., has received a third Army-Navy "E" award, consisting of a flag with two stars, signifying continued excellence in the production of war equipment.

The B. F. Goodrich Co., Akron, Ohio, has elected Willis F. Avery as secretary of the company. He was formerly assistant secretary. Mr. Avery succeeds the late Shelby M. Jett.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced the appointment of C. C. Van Zandt as sales manager in charge of sales of the crushing, cement and mining section, and H. K. Swan as sales manager in charge of milling and oil extraction and saw and pulp mill sections.

Hyster Co., Portland, Ore., and Peoria, Ill., has announced the following changes in executive personnel: Philip S. Hill, who has been assistant manager of the eastern division at Peoria, Ill., returns to Portland, Ore., as general sales manager; Glen M. Ede, formerly general purchasing agent, becomes assistant manager of the industrial truck division; C. B. Bamberg, formerly assistant purchasing agent, has been made purchasing agent; B. G. Nordling has been made manager of the parts department.

Philip S. Hill

Pioneer Engineering Works, Minneapolis, Minn., announces the appointment of the Anderson Engineering Co., Cambridge, Mass., to represent them in the States of Maine, New Hampshire, Vermont, Rhode Island, and Massachusetts excepting the four western counties, also the appointment of the Tyler Equipment Corp., Springfield, Mass., to represent them in the State of Connecticut (with the exception of Fairfield County) and in the four western counties of Massachusetts.

Nordberg Mfg. Co., Milwaukee, Wis., has acquired the controlling interest in the Northern Processing Machinery Co., Cleveland, Ohio, which will operate hereafter as a subsidiary of the company under the corporate name of Nordberg Process Machinery Co. R. R. Shafter, one of the founders of the Northern Processing Machinery Co., will continue as vice-president and general manager of the subsidiary, with headquarters in the Lincoln Bldg., 60 E. 42nd St., New York, N. Y.

PULVERIZERS for the reduction of Cement Materials, Limestone, **Agricultural Limestone,** Fire Clay and All Dry, Refractory Materials.

Capacities: 1 to 60 tons per hour **Finenesses: 20 to 350 mesh**

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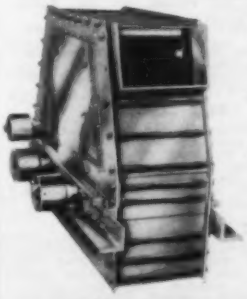
ALLENTOWN, PENNA.

To Increase Capacities or Fineness of Present Grinding Plant—
To Reduce Power and Maintenance Costs—
To Insure an Absolutely Uniform Product—

***Use the* BRADLEY AIR SEPARATOR**



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● Its astonishing efficiency reduces material from 30 in. to an optional minimum of 80% under one inch in one operation. Handles 100 to 150 tons per hr. with only 50 to 75 hp. For portable or stationary units. Combines expensive primary and secondary machinery in one operation. Write today for complete details on this new machine which operates on a new basic principle. Address Department RP-11.

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NEW HOLLAND, PENNSYLVANIA

ERIE TRUCK MIXER PLANTS

Erie builds a complete line of central concrete plants to keep truck mixers on the move.

Consult Erie now for the most modern of Post-war Plants.

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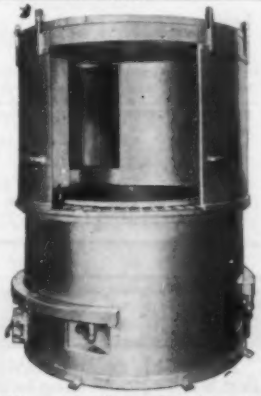

Oil or Gas Fired Capacities 300 to 5,800 lbs. zinc.

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for re-zincing gyratory crusher concaves

Fisher Iron Pot Furnaces provide a safe, convenient and economical method of melting and handling metal for re-zincing crusher concaves. Cast iron pot may be hoisted from furnace for pouring into transfer ladle or lowered into crusher for direct pouring. Write for Bulletin No. 550 showing Iron Pot Furnace and other furnaces for brass, bronze, aluminum, magnesium, tin, lead, zinc and precious metals.

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Engineers and Manufacturers

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An employer who buys "main, strength and awkwardness" is a loser. The modern, profitable way is to see that employees have the *most suitable equipment* to do the job the easy way. Get it from E.C.A.

CLAMSHELL BUCKET

1—5 yd. Kiesler bucket, Style N, digging or rehandling. New 1943. Wt. 11,500 lbs.

AIR COMPRESSORS

Portable and stationary, belt with elec. or gas power, sizes from 20 cu. ft. to 1,000 cu. ft.

CRANES AND SHOVELS

1—1¼ yd. Erie gas air Model GA2, Serial No. 9758, with 45' boom and shovel attachment.
1—1 yd. Mdl. 600 P. & H., Serial No. 3502, 40' boom and backhoe attachment.
1—1 yd. Marion, Mdl. 440, Serial No. 5961, 50' boom.
1—¾ yd. Conco crane, Serial No. 1304, fully revolving, power 70 HP. Continental gas engine, 30' boom.
1—¾ yd. Koehring crane, Model 301, with 45' boom, Serial No. 722. Gasoline powered.
1—¾ yd. P. & H. Model 400 crawler crane, Serial No. 4136, with 40' boom, gasoline powered.
1—½ yd. P. & H. shovel, Model No. 204, Serial No. 2303, gasoline powered.
1—¾ yd. Erie Model B2 crawler crane, steam powered, Serial No. 4027, with 50' boom and shovel attachment.

CONVEYORS

1—100' stationary troughing type belt conveyor, 16" wide.
1—30' Link-Belt troughing type portable, 15" wide.
1—25' Northern troughing type portable, 18" wide. With elect. or gas power.

ELECTRIC CRANE

1—18 Ton O & S type B crane, mtd. on 8'-0" ga. track. 50' boom. Power 52 H.P. 440/60/3 elect. motor.

CRUSHERS

1—9x12" Rogers jaw crusher (Like New).
1—No. 4 Champion jaw crusher, size 9x15", Serial No. 2606.
1—No. 2 Climax jaw crusher, size 9x16".
1—Buchanan jaw crusher, size 10x16".
1—Acme jaw crusher, Ser. No. 1873, size 12x20".
1—Acme jaw crusher, Ser. No. 1686, size 9x16".
1—United Iron Works, "Blake-type" jaw crusher, size 9½x24".
1—9x12" Rogers jaw crusher, No. 314. LIKE NEW.
1—10x12" Colorado Iron Works roll crusher. Laboratory type.
1—Allis-Chalmers, No. 5 gyratory crusher, Ser. No. 5331, opening 10x38".
1—Austin No. 5 gyratory crusher, Ser. No. 2945, opening 12x35½".

DERRICKS

3—Steel Guy Derricks: 1—20-ton American, steel derrick, 110' mast, 100' boom; 1—5-ton Terry Guy Derrick, 70' mast, 60' boom; 1—5-ton Insley, 75' mast, 80' boom. Stiff leg derricks: 1—35-ton Hunter, 40' mast, 80' boom; 1—5-ton Pittsburgh, 26' boom, 15' mast. Also a number of wood stiff leg derricks, to 5-ton cap.

HOISTS (Elec., Gas, Steam)

85—Electric, ranging from 20 HP. up to 125 HP., consisting of triple-drum, double-drum and single-drum, with AC or DC motors, some with attached swingers. Following makes: American, Clyde, Lambert, Lidgerwood and National.
Gas hoists ranging from 8 to 120 HP., single, double and triple-drums; all standard makes (38 in stock).
Steam, ranging from 8 HP. to 60 HP., single, double and triple-drum; all standard makes.

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BELTED: 355, 528, 676, 1000, 1300 & 1570 Ft.
ELECTRIC: 478, 676, 807, 1302, 1722 & 2200 Ft.
DIESEL: 603, 807 & 1000 Ft.
PORTABLE GAS: 110, 160, 230, 310, 540 & 1300 Ft.
STEAM: 49, 310, 528, 1300, 2200 & 3600 Ft.

CLAMSHELL BUCKETS, SKIPS & GRAPPLES

Owen E A & H Stone Grapples.
2 Yd. OWEN Type S Material Handling.
1½ Yd., 1 Yd. & ¾ Yd. HAYWARD Class E.
18 Steel Skips 6½ x 6 x 2½.
5 Ton Bucyrus Rock Grabs.

CRANES AND DRAGLINES

1—16 Yd. 160' Boom Electric Caterpillar Dragline.
⅝ Yd. 5 Ton O & S 30 Ft. Boom.
12 Ton NORTHWEST 50 Ft. Boom Gas.
20 Ton LIMA, 750 Diesel, 65 Ft. Boom.
25 Ton BROWNING & 30 Ton AMERICAN Loco.
25 Ton LINK BELT K-48 Electric, 70 Ft. Boom.

CATERPILLAR SHOVELS

¾ Yd. Lima Diesel.
2 Yd. Marion Steam Shovel.
⅜ Yd., 1½ Yd., 2 Yd. & 4 Yd. MARION Electrics.
1 Yd. NORTHWEST Gas.
1½ Yd. LIMA Diesel.
1½ Yd. BUCYRUS 41B Steamer.
4 Yd. Bucyrus 120 B Electric. Also 3 yd. Erie Elec.

DUMP CARS

46—KOPPEL 1½ Yd. 24 & 30 In. Ga., V Shaped.
15—2 Yd., 3 Yd., 4 Yd., 6 Yd., 13 Yd., 36 In. Ga.
20—Std. Ga. 12 Yd., 16 Yd., 20 Yd. & 30 Yd. Cap.
15—Std. Ga. 50 Ton Battleship Gondolas.

FLAT CARS

9—50 ton std. ga. heavy duty flat cars.

HOISTING ENGINES

Gas: 15, 30, 60, 100 & 120 HP.
Electric: 30, 52, 80, 100 & 150 HP.
Steam: 6½x8, 7x10, 8½x10, 10x12, 12x24.

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75, 90, 180, 200 HP. F. M. Engines.
110 HP Ingersol Rand Engine.
175 KVA Worthington 3/60/2300.
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5'x22" HARDINGE CON. Dry Ball Mill.
6'x22" HARDINGE CONICAL Pebble Mill.
8'x22" HARDINGE CONICAL Ball or Pebble Mill.
4x8, 8x6 & 10x9 Straight Ball Mills.
4x16, 5x18 & 5x22 Tube Mills & 6'x22'.
3½x8 & 5x7 Air Swept Tube Mills.
2x4½, 6x12 & 5x12 ROD MILLS.

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JEFFERY, 24x20 & No. 1 Sturtevant Ring Roll.
RAYMOND Auto Pulverizer No. 0000, 0 & 3.

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10,000 Gal., 15,000 Gal. & 20,000 Gal. Cap.

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8, 10 and 14 ft. Separators, Gayco & Bradley.

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36x60 Fairmount & 36x20 Diamond.

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10x8, 13x7½, 14x7, 15x9, 15x10, 16x9, 16x12, 16x10, 18x11, 20x8, 20x6, 20x10, 20x12, 26x12, 30x15, 30x13, 36x15, 36x30, 36x18, 36x14, 36x9, 36x6, 36x10, 36x24, 42x9, 48x24, 48x36, 60x42, 84x66, 26x16, 9x36.

CONE & GYRATORY CRUSHERS

5 No. 19, 25, 37 & 49 Kennedy.
18 in., 24 in., 30 in., 36 in. & 48 in. Symons Disc.
4—10 TZ Traylor 4 ft. Gyratory.
4—Nos. 5, 3 & 6 Austin Gyratory.
2—Traylor T-12 Bulldog Gyratory, also 16 inch 8 in. Traylor T. Gyratory.
17 Gates K—Nos. 3, 4, 5, 6, 7½, 8, 9½ & 21.
10 Inch Austin Model 105.
6, 10 & 13 Inch Superior McCullys.

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BELT: 1000 Ft. 60 In., 700 Ft. 40 In., 600 Ft. 36 In. 800 Ft. 30 In., 1642 Ft. 24 In., 517 Ft. 20 In., 297 Ft. 18 In., 500 Ft. 16 In., 300 Ft. 14 In.
IDLERS: 54 In., 42 In., 36 In., 30 In., 24 In., 20 In., 18 In., 16 In. & 14 In.
Head & Tail—Pulleys—Takeup for all sizes.
Steel Frames: 2,000 Ft. 24 In., 30 In. & 36 In. Sections

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36 In. x 20 Ft., 3 Ft. x 30 Ft., 4 Ft. x 30 Ft., 54 In. x 30 Ft., 42 In. x 24 Ft., 5 Ft. x 30 Ft., 5 Ft. x 16 Ft., 5 Ft. x 60 Ft., 6 Ft. x 60 Ft., 6 Ft. x 20 Ft., 6 Ft. x 70 Ft., 10x20, 7½ x 100 & 8x110 Ft. Kilns.

STEEL DERRICKS

GUY: 8 Ton 85 Ft. Boom, 15 Ton 100 Ft. Boom, 20 Ton 115 Ft. Boom, 50 Ton 100 Ft. Boom.
STIFF LEG: 5 Ton 70 Ft. Boom, 15 Ton 100 Ft. Boom, 25 Ton 100 Ft. Boom, 75 Ton 135 Ft. Boom.

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GASOLINE: 3 Ton, 5 Ton, 8 Ton, 12, 14, and 30 Ton.
STEAM: 9 Ton, 20 Ton, 40 Ton, 60 Ton & 80 Ton.
ELECTRIC: 2 Ton, 5 Ton, 8 Ton, 40 Ton.
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VIBRATING: 2x4, 3x6, 12x8, 3x8, 3x5, 4x5, 4x8, 4x10, 48x72, & 4x12. 1, 2 & 3 Deck.
HUMMER BOTEX, NIAGARA & ROBINS.
REVOLVING: 3x12, 3x16, 3½x18, 3x24, 4x16, 4x20, 4x33, 4x24, 5x30, 5x20, 6x20.

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Double drum Novo Hoist with 4 cylinder Novo gasoline engine directly connected on heavy cast iron base
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Model 82 Barber Greene Bucket Loader on caterpilar with 4 cylinder Buda Engine with self-starter
1—1¾ yd. shovel bucket, manganese heavy duty
1—1¼ yd. Clamshell material handling Bucket

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COMPLETE BLOCK PLANT

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5 Attachments
1 Electric attachment for bevel face
1—Blystone 14 cu. ft. Mixer.
1—Skip Hoist.
2100 Plain Steel Pallets.
60—Racks (36 block capacity each).
2—Lewis-Shephard Jack Lift Trucks.
All Electric Motors
Plant is in operation
Your inspection invited.
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FOR SALE
Without Priority
COMPLETE USED BLOCK PLANT EQUIPMENT

2—Stearns Automatic Clipper Strippers
1—Stearns 18 cu. ft. mixer
1—Barrett Craven lift truck
10,000—4", 8" & 12" pressed steel pallets.

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WEST PALM BEACH, FLORIDA

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GYRATORY: 42" Gates K, 30" Superior McCully (Like new), 30" Superior McCully Gates Nos. 12, 10, 9, 8, 7½, 6, 5, 4, 3, 2, 1 (75 avail.) Telsmith Nos. 4, 5, 6, 8C, 9 & 16. Also many Austins, Kennedys and Traylors, many sizes.
JAW TYPE: Traylor 60x84, 48x60, 42x48, 24x72. Superior 84x66 & 24x36. Buchanan 30x42. Farrel 60x42, 30x36, 24x36, 18x36, 12x24. Good Roads 1030. Acme 24x40. Misc. 7x12, 9x16, 8x20, 8x24, 12x24, 9x36, 15x36.
REDUC. TYPE: Kennedy Nos. 25, 37 & 49. Telsmith 3-F & 40. Traylor 36" TZ, 8", 10", 12". Super. McCully 6"x10". Newhouse 5, 7, & 10". Symons Cone & Disc Ty. 2' to 4'.
ROLLS: Allis-C. 12½x12, 36x10, 40x15, 54x24 & 72x30. Fairmount 36x60 & Jeffrey 24x24 to 36x54 single roll. Cornish 36x14 & 42x16, Etc.
HAMMERMILLS: Williams No. 1, 2, 3, 4, 8, & 9, Jeffrey 36x18 & 36x42. Day Nos. 20 & 40. Etc.
MILLS: Kennedy Ball 4x6, 5x6 & 5x8. Marcy 8x6 & 10x9. Hardinge 6'x3', 8'x30" & 6'x9'. Misc. Tube Mills 5' & 6'x22'. Sturtevant Ring Roll. Raymonds. Kents. Fuller Lehigh. Etc.
CRUSHING PLANTS: No. 63 Diamond No. 22 Pioneer 8x24. 10x30 Good Roads, 9x40 Austin-Western, 9x36 C.B.

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Barges, Bins, Buckets, Boilers, Cableways, Cars, Compressors, Conveyors, Cranes, Dryer, Derricks, Elevators, Excavators, Generators, Hoists, Kilns, Draglines, Drag Scrapers, Dredges, Drills, Engines, Locomotives, Loaders, Motors, Pipe, Pumps, Rail, Scales, Screens, Slacklines, Shovels, Tanks, Trucks, Tractors, Etc., in many sizes, types and makes at low prices. (I have equipment at many points in the United States and Canada. What you need may be near your plant.)

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42"	5	1/8"	1/16"	20"	4	1/8"	1/32"
36"	6	1/8"	1/16"	18"	4	1/8"	1/32"
30"	6	1/8"	1/16"	16"	4	1/8"	1/32"
30"	5	1/8"	1/16"	14"	4	1/16"	1/32"
24"	5	1/8"	1/32"	12"	4	1/16"	1/32"
24"	4	1/8"	1/32"				

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16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
12"	5	6"	6	3"	4

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1½"	50 "	15.00
	25 "	10.00
	35 "	14.00
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¾"	25 "	6.25	2.50 "
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Electric generators for "HUMMER" screens
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1—13000 GPM, 170' head, Turbine driven
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50 Pumps, all sizes, motor and turbine driven

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1000—230 volt DC and 220, 440 and 2300 volt, 3 ph, 60 cyc. From 1—500 HP

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Steel Storage Bins—from 230 cu. ft. to 35,000 cu. ft.
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200 HP Motor Driven Mine Hoist, single drum

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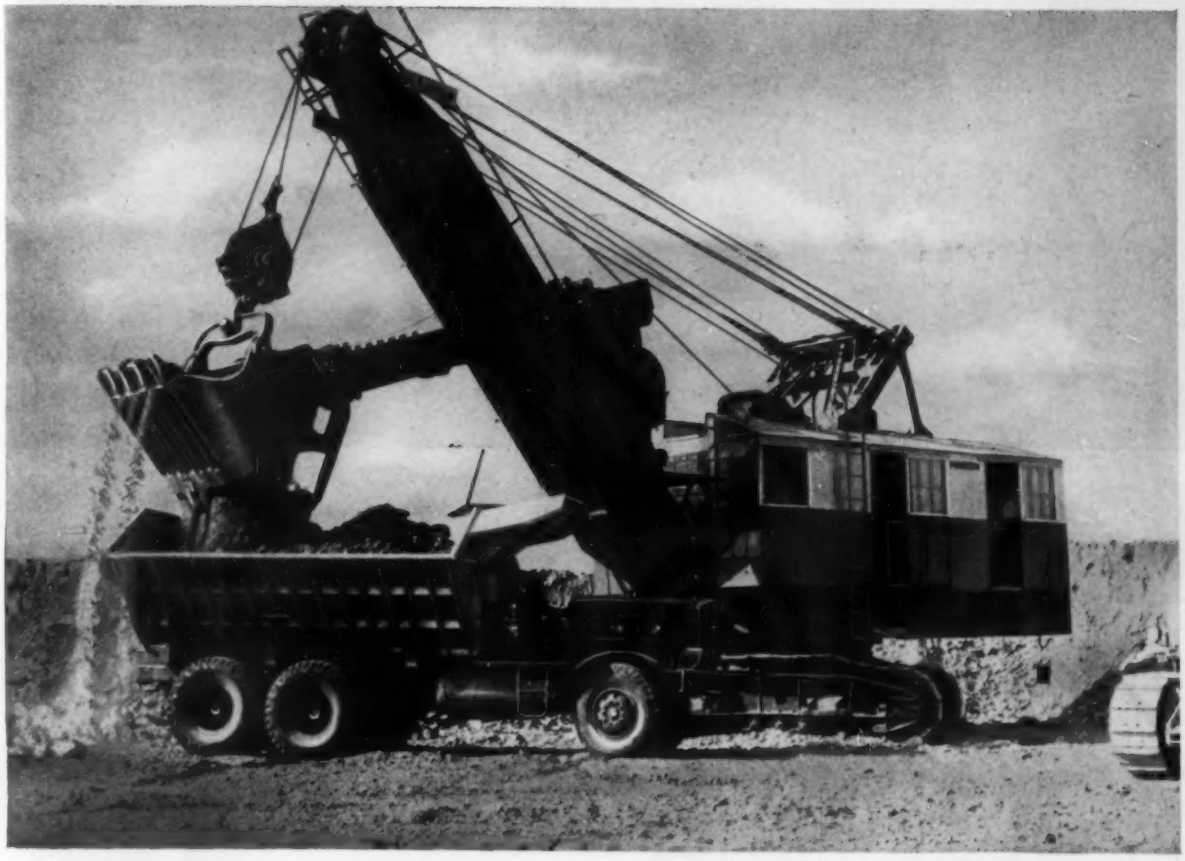

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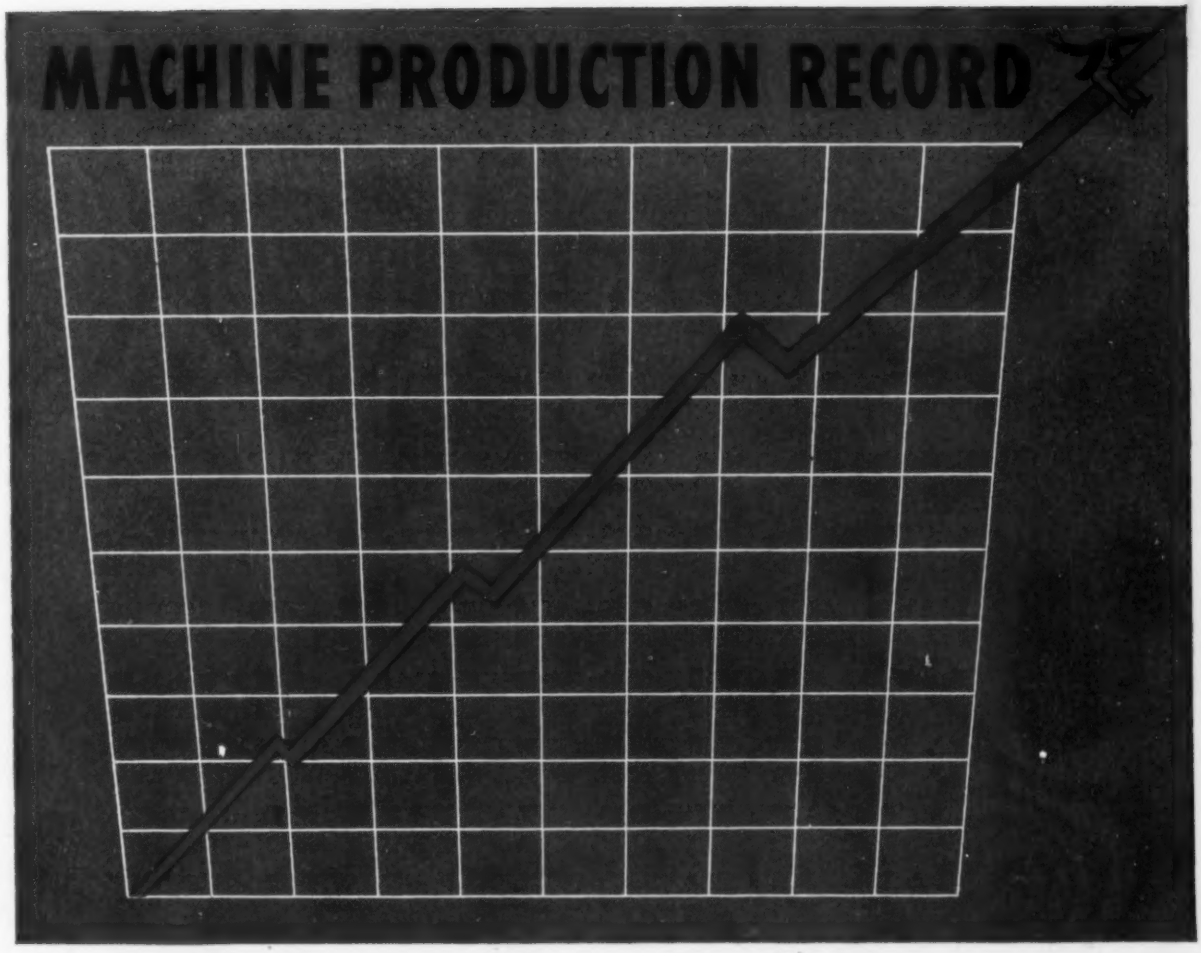

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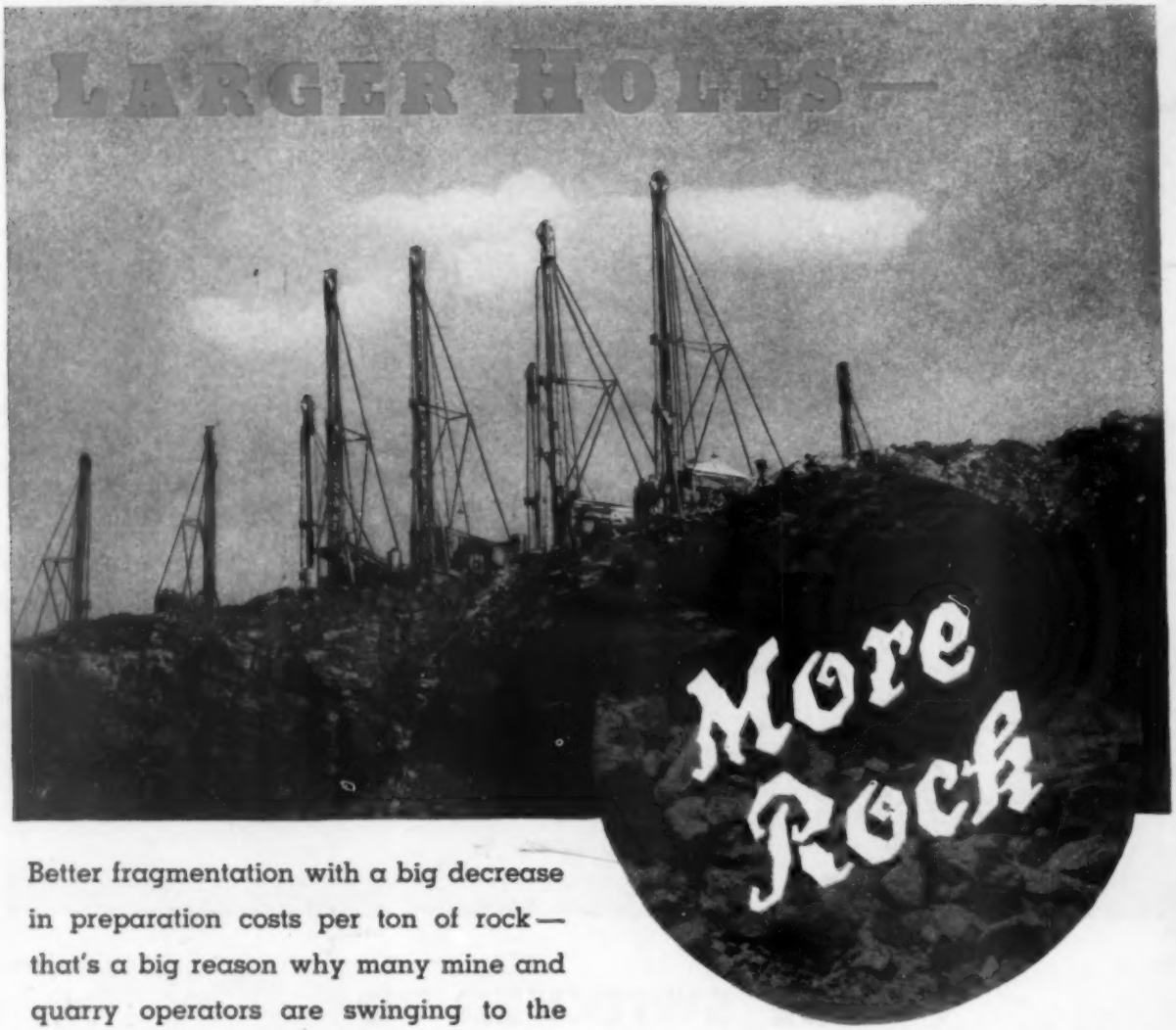

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